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Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-12702 Brigham Young Univ., Provo, Utah.
AN AERODYNAMIC INVESTIGATION OF THE CAUSES OF OVERHEAD ELECTRICAL TRANSMISSION LINE GALLOP Ph.D. Thesis
Eric Nathan Skousen 1973 186 p
Avail: Univ. Microfilms Order No. 73-19592

The aerodynamic properties of galloping transmission lines were studied with static and dynamic wind-tunnel tests on two unstable airfoils--the D-section and the cable-with-messenger. Static tests refer to the lift, drag and moment forces being measured while the airfoil is at one fixed angle-of-attack. Dynamic tests refer to the lift, drag and moment forces being measured when the airfoil is oscillating in the wind stream. Static and dynamic data is provided with a range of wind velocities of 1.9-27 meters per second. Dynamic tests included variations in: (1) maximum angle-of-attack, (2) frequency of oscillation and (3) wind velocity. Aerodynamic hysteresis was observed in the dynamic data. Lift, drag and moment forces were found to be different in the dynmaic method thus showing that more aerodynamic energy is being fed into the galloping cable system than was previously supposed (using static data). Dissert. Abstr

N74-12703 Engineering Sciences Data Unit, London (England).
AEROFOILS HAVING A SPECIFIED FORM OF UPPER-SURFACE PRESSURE DISTRIBUTIONS: DETAILS AND COMMENTS ON DESIGN
Oct. 1973 24 p refs Supersedes ESDU-67010 Sponsored by Min. of Defence and Roy. Aeron. Soc.
(ESDU-71020; ESDU-67010) Copyright. Avail: Issuing Activity

Details of a series of airfoils that have been used for parametric studies of drag-rise Mach number, of profile drag at the drag-rise Mach number, and for a limited study of profile drag at off-design conditions. A specified form of upper-surface pressure distribution at the drag-rise Mach number which is appropriate for application to swept wings at high subsonic and low supersonic speeds is presented. The influence that the principal design variables have on the geometric shape of the cambered airfoils which were derived from the pressure distribution specification is analyzed. Tables of data are included to show the aerodynamic coefficients for various airfoil shapes. Author

N74-12704 Engineering Sciences Data Unit, London (England).
DRAG OF TWO-DIMENSIONAL STEPS AND RIDGES IMMERSED IN A TURBULENT BOUNDARY LAYER AT SUBSONIC AND SUPERSONIC SPEEDS
Oct. 1972 23 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-73028) Copyright. Avail: Issuing Activity

The aerodynamic characteristics of two dimensional steps and ridges in a turbulent boundary layer at subsonic and supersonic speeds were investigated. The excrescences are produced on a flat plate at zero incidence and with zero heat transfer. The data apply to excrescences with heights up to about one tenth of the boundary layer thickness. Cross sections of the excrescences used in the tests are provided. A mathematical model is developed to show typical calculation procedures and data for the various configurations are provided in graph form. Author

N74-12705*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HYPERSONIC AERODYNAMIC CHARACTERISTICS OF A FAMILY OF POWER-LAW, WING BODY CONFIGURATIONS
James C. Townsend Washington Dec. 1973 48 p refs
(NASA-TN-D-7427; L-7176) Avail: NTIS HC $3.00 CSCL 01A

The configurations analyzed are half-axisymmetric, power-law bodies surmounted by thin, flat wings. The wing planform matches the body shock-wave shape. Analytic solutions of the hypersonic small disturbance equations form a basis for calculating the longitudinal aerodynamic characteristics. Boundary-layer displacement effects on the body and the wing upper surface are approximated. Skin friction is estimated by using compressible, laminar boundary-layer solutions. Good agreement was obtained with available experimental data for which the basic theoretical assumptions were satisfied. The method is used to estimate the effects of power-law, fineness ratio, and Mach number variations at full-scale conditions. The computer program is included.
Author

N74-12706# Lockheed Missiles and Space Co., Palo Alto, Calif.
THE INFLUENCE OF A DEFLECTED CENTRAL SPIKE ON THE AERODYNAMIC COEFFICIENTS OF A ROTATIONALLY SYMMETRIC HYPERSONIC BODY
W. Wyborny [1973] 37 p refs Transl. into ENGLISH of West German report DLR-69-37, 1969
(DLR-FB-69-37) Avail: NTIS HC $4.00, National Translations Center, John Crerar Library, Chicago, Illinois 60616

The possibility of producing a normal component force on simple cylinders by deflecting a central spike was studied. Results of measurements are presented, and a simple analytical estimate of the aerodynamic coefficients for a central spike deflection without incidence on the main body is presented. It is shown that significant normal forces can be produced on a deflected central spike on a cylindrical model by the altered free stream around the main body. These forces are adequate for control purposes. F.O.S.

N74-12707# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
MEASUREMENTS OF THE BOUNDARY LAYER AND WAKE OF TWO AEROFOIL SECTIONS AT HIGH REYNOLDS NUMBERS AND HIGH SUBSONIC MACH NUMBERS

T. A. Cook London Aeron. Res. Council 1973 91 p refs Supersedes RAE-TR-71127; ARC-33660
(ARC-R/M-3722; RAE-TR-71127; ARC-33660) Avail: NTIS HC $6.75; HMSO £3.30; PHI $12.95

Boundary layer and wake surveys were made on two cambered lifting airfoils. Skin/friction obtained, using four integral laws results from a Clauser analysis of profile data, are consistent but values obtained, using Preston tubes, are 8 per cent higher than these, probably due to uncertainties in the compressibility corrections required. Results from razor/blade measurements are 5 per cent lower. Momentum thickness, shape parameter and skin friction were compared with boundary/layer estimates made, using (1) Green's extension to compressible flow of Head's entrainment method and Bradshaw's turbulent-energy method. Agreement is generally good, though both methods underestimate momentum thickness at the trailing edge on the upper surface. Wake estimates were made, using Green's entrainment method, and agreement is generally good. There are discrepancies between measurements and Green's method regarding the entrainment parameter used in the boundary layer. Author (ESRO)

N74-13674 National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
REYNOLDS NUMBER EFFECTS AT LOW SPEEDS ON THE MAXIMUM LIFT OF TWO-DIMENSIONAL AEROFOIL SECTIONS EQUIPPED WITH MECHANICAL HIGH LIFT DEVICES
J. A. Thain *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Sep. 1973 p 1-24 refs (For availability see N74-13673 04-34)

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-12708 Texas A&M Univ., College Station.
WAKE INDUCED LOADS ON HELICOPTER ROTOR BLADES Ph.D. Thesis
Thaddens Howes Sandford 1973 142 p
Avail: Univ. Microfilms Order No. 73-21699

The effects of the curved wake on the airloads of a helicopter blade in hovering flight are discussed. In most investigations of unsteady airloads, two-dimensional strip theory is used and the wake is assumed to be rectilinera. A few authors have tried to include the effects of the curved wake on a lifting line basis, but it is believed that no one has yet attempted to solve the problem on the basis of a full lifting surface theory. By using numerical technique this is accomplished, and comparisons are made between the aerodynamic coefficients calculated with and without a curved wake. It is shown that inclusion of wake curvature has an appreciable effect on the blade's life and pitching moment coefficients. Dissert. Abstr.

N74-12709 Engineering Sciences Data Unit, London (England).
APPROXIMATE METHODS FOR ESTIMATION OF CRUISE RANGE AND ENDURANCE: AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES
Oct. 1973 45 p Sponsored by Roy. Aeron. Soc.
(ESDU-73019) Copyright. Avail: Issuing Activity

Approximate methods are given for estimating the cruise range and endurance performance of aircraft equipped with turbojet and turbofan engines. The methods are suited to project type calculations and provide results applicable in still air. The equations have analytical solutions for cases of cruising flight in which at least one of the parameters of airspeed, Mach number, pressure height, and engine control setting is held constant. The conditions under which specific air range and specific endurance may be maximized are examined and expressions for air range and endurance are presented for each cruise case. Author

N74-12710 Engineering Sciences Data Unit, London (England).
INTRODUCTION TO ESTIMATION OF RANGE AND ENDURANCE: AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES
Oct. 1973 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-73018) Copyright. Avail: Issuing Activity

The aircraft, engine, flight path, and other factors which affect the specific range and endurance of turbojet and turbofan powered aircraft are analyzed. Mathematical models are developed to establish the relationships between these parameters. Methods of solving the equations are discussed. Author

N74-12711 Engineering Sciences Data Unit, London (England).
NON DIMENSIONAL METHODS FOR THE MEASUREMENT OF HOVER PERFORMANCE OF TURBINE ENGINED HELICOPTERS
Nov. 1973 13 p Sponsored by Roy. Aeron. Soc.
(ESDU-73027) Copyright. Avail: Issuing Activity

Test methods for helicopter hovering flight based on the measurement of engine shaft power output are presented. The methods are applied to the following cases: (1) where helicopter mass is used instead of weight, (2) where collective pitch is measured instead of power, and (3) presentation of helicopter fuel flow data. Mathematical models for a typical helicopter condition are developed. The data are presented in the form of tables and graphs. Author

N74-12712 Engineering Sciences Data Unit, London (England).
INTRODUCTION TO NONDIMENSIONAL METHODS FOR THE MEASUREMENT OF PERFORMANCE OF TURBINE-ENGINED HELICOPTERS
Nov. 1973 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-73026) Copyright. Avail: Issuing Activity

Methods of measuring the steady state performance of turbine engined helicopters in terms of nondimensional parameters are presented. The basis of the test methods is the arrangement of the relevant dimensional qualities into several nondimensional parameters by means of dimensional analysis. The relationship between any given pair of nondimensional parameters is established for a given flight condition by flying the helicopter to maintain constant values of each of the remaining nondimensional parameters. Helicopter performance is measured in terms of power, and in some cases, the rotor collective pitch angle required to maintain steady flight under various atmospheric conditions and aerodynamic configurations. Author

N74-12713# Advisory Group for Aerospace Research and Development, Paris (France).
MARKINGS FOR PROPELLER CONSPICUITY
T. C. D. Whiteside (RAF Inst. of Aviation Med.) Sep. 1973 17 p refs
(AGARD-AR-56) Avail: NTIS HC $3.00

The general problem of marking propellers so that they may be seen is discussed. The propeller must be conspicuous to persons walking near it when the aircraft is on the ground but, on the other hand, in taxying and in flight it must not be distracting or annoying to the pilot. Other factors to be considered are the conspicuity at low and at high rpm; the conspicuity against various backgrounds since markings easily visible against a dark ground may not be visible against a light ground; the use of coloured markings which, although easily seen on a stationary propeller, become desaturated when the propeller is turning, and finally, the presence of brightness and of colour contrast with the background. In theory, to obtain maximal brightness contrast, black and white markings should be used so that the blades may be seen against either light and dark background. As black matt paint may appear grey since it scatters incident light, the markings should be in a gloss finish. Author

N74-12714*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LOW-SPEED WIND TUNNEL INVESTIGATION OF THE

LATERAL-DIRECTIONAL CHARACTERISITCS OF A LARGE-SCALE VARIABLE WING-SWEEP FIGHTER MODEL IN THE HIGH-LIFT CONFIGURATION
William T. Eckert and Ralph L. Maki Oct. 1973 35 p ref
Prepared in cooperation with Army Air Mobility Res. and Develop. Lab., Moffett Field, Calif.
(NASA-TM-X-62306) Avail: NTIS HC $3.75 CSCL 01B

The low-speed characteristics of a large-scale model of the F-14A aircraft were studied in tests conducted in the Ames Research Center 40- by 80-Foot Wind Tunnel. The primary purpose of the present tests was the determination of lateral-directional stability levels and control effectiveness of the aircraft in its high-lift configuration. Tests were conducted at wing angles of attack between minus 2 deg and 30 deg and with sideslip angles between minus 12 deg and 12 deg. Data were taken at a Reynolds number of 8.0 million based on a wing mean aerodynamic chord of 2.24 m (7.36 ft). The model configuration was changed as required to show the effects of direct lift control (spoilers) at yaw, yaw angle with speed brake deflected, and various amounts and combinations of roll control. Author

N74-12715*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRENDS IN TRANSPORT AIRCRAFT AVIONICS
Betty K. Berkstresser Dec. 1973 83 p refs
(NASA-TM-X-62322) Avail: NTIS HC $6.25 CSCL 01C

A survey of avionics onboard present commercial transport aircraft was conducted to identify trends in avionics systems characteristics and to determine the impact of technology advances on equipment weight, cost, reliability, and maintainability. Transport aircraft avionics systems are described under the headings of communication, navigation, flight control, and instrumentation. The equipment included in each section is described functionally. However, since more detailed descriptions of the equipment can be found in other sources, the description is limited and emphasis is put on configuration requirements. Since airborne avionics systems must interface with ground facilities, certain ground facilities are described as they relate to the airborne systems, with special emphasis on air traffic control and all-weather landing capability. Author

N74-12716# National Aviation Facilities Experimental Center, Atlantic City, N.J.
EVALUATION OF THE STRUCTURAL INTEGRITY OF AN AIRCRAFT LOADING WALKWAY UNDER SEVERE FUEL-SPILL FIRE CONDITIONS Final Report, Dec. 1972 - Oct. 1973
George B. Geyer, Lawrence M. Neri, and Charles H. Urban Oct. 1973 106 p refs Sponsored in part by Air Transport Assoc. of Am. Original contains color illustrations
(FAA-RD-73-144; FAA-NA-73-79) Avail: NTIS HC $7.50

A full-scale fire test was conducted to determine the capability of an aircraft loading walkway to provide a safe emergency egress route for passengers from an aircraft when it is exposed to severe fuel-spill fire conditions in term of structural integrity and of maintaining survivable environmental conditions within the structure. Fire exposure of the walkway indicated that the structural integrity of the walkway maintained throughtout the 10 minute fire exposure period and that the most serious problem confronting passengers passing through the tunnel would be caused by smoke and the pyrolysis of the underside of the plywood flooring adjacent to the corrugated steel shell. Small-scale laboratory tests of modified floor panels indicated that by employing thermally stable load-bearing materials the quantity of pyrolysis products and smoke can be controlled within the walkway. Author

N74-12717*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN AND FABRICATION OF AN AEROELASTIC FLAP ELEMENT FOR A SHORT TAKEOFF AND LANDING (STOL) AIRCRAFT MODEL Final Report
G. W. Belleman and R. R. June Dec. 1973 36 p
(Contract NAS1-11767)
(NASA-CR-132339; D6-41253) Avail: NTIS HC $4.00 CSCL 01C

A flap element typifying a third element in the flap system of a short takeoff and landing aircraft was designed, fabricated, and instrumented. It was delivered to NASA for flight-simulated testing. The flap element was aluminum skin-stringer-rib construction with adhesive laminated skins. The tests conducted were as follows: (1) sonic check, (2) thermal expansion, (3) end fitting stiffness, (4) material properties, (5) maximum bending stress in the skin, and (6) effective skin width and stringer spacing. Author

N74-12718# National Aviation Facilities Experimental Center, Atlantic City, N.J.
THE MEASUREMENT OF THE DC-7 TRAILING VORTEX SYSTEM USING THE TOWER FLY-BY TECHNIQUE Final Report, Apr. - Sep. 1971
Leo J. Garodz, Nelson J. Miller, and David Lawrence Nov. 1973 375 p refs
(FAA-RD-73-141; FAA-NA-73-34) Avail: NTIS HC $20.75

The results of a series of fullscale flight tests are presented in which the wing trailing vortices of the Douglas DC-7 airplane were investigated by flying the airplane at low altitude, upwind of, and in close proximity to a 140-foot instrumented tower. Tower instrumentation consisted of hot-film anemometers located at 4-foot intervals and wind velocity and direction sensors. Vortex air flow visualization was by use of colored smoke. The data consists of tangential velocity distribution plots, peak recorded velocity as a function of time, airplane configuration and wind; vortex vertical and lateral transport velocities, and specimen time histories of the velocities recorded at individual sensors. Author

N74-12719*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECTS OF AN AUTOPILOT ON AIRPLANE RESPONSES TO TURBULENCE WITH EMPHASIS ON TAIL LOADS
Boyd Perry, III Washington Dec. 1973 53 p refs
(NASA-TN-D-7231; L-8756) Avail: NTIS HC $3.50 CSCL 01C

An analytical study has been made to assess the loads developed on the horizontal tail of an autopilot-controlled rigid airplane flying in one-dimensional atmospheric turbulence. The root-mean-square values of rigid-airframe responses and tail-load responses were calculated at five flight conditions, and the behavior of these responses was observed in two autopilot modes: pitch-attitude-hold mode and altitude-control mode. It was found that pitch attitude and altitude can be controlled by the simple autopilot with acceptable or no increases in tail loads. Author

N74-12720*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
FLIGHT EXPERIENCE WITH THE DECELERATING NOISE ABATEMENT APPROACH
Terrill W. Putman Jan. 1974 18 p refs
(NASA-TM-X-56020) Avail: NTIS HC $3.00 CSCL 20A

The noise of older aircraft can be reduced in two principal ways: retrofitting the aircraft with a quiet propulsion system, and changing the flight operational procedures used in flying the aircraft. The former approach has already proved to be expensive, time consuming, and difficult to implement even though low-noise propulsion system technology exists. The latter method seems to hold promise of being less expensive and easier to implement. One operational technique which might reduce the noise beneath the landing approach path is the decelerating approach. This technique requires intercepting the 3 deg approach path at a relatively high speed with the aircraft in the cruise configuration, then reducing the thrust to idle and allowing the aircraft to decelerate along the 3 deg approach path. As the appropriate airspeed is achieved, the landing flaps and landing gear are deployed for a normal flare and landing. Because the engines, which are the predominant noise source on landing approach, are at idle thrust, a significant reduction in the noise beneath the approach path should be realized. Author

N74-12721# Research Inst. of National Defence, Stockholm (Sweden).
IDENTIFICATION TESTS WITH OPTICAL SIGHTS AND RECONNAISSANCE AIDS IN HELICOPTERS [IDENTIFIERINGSFOERSOEK MED OPTISKA SIKTEN OCH SPANINGSHJAELPMEDEL I HKP]
Kurt Andersson and Lars-Otto Nilsson Mar. 1972 55 p refs In SWEDISH; partly in ENGLISH

(FOA-2-C-2533-D8/E1/M6) Avail: NTIS HC $4.75

A gyro stablized sight and reconnaissance aid mounted in a helicopter was studied to obtain an understanding of the basic performance of modern types of stabilized magnifying optics. The information from the trials was partly to recognize different types of vehicles, e.g. track, wheel or hovercraft and partly to identify the type of tracked vehicle. Author

N74-12722# Research Inst. of National Defence, Stockholm (Sweden).

HELICOPTER NOISE [HELIKOPTERLJUD]

Ingemar Eriksson Nov. 1971 13 p refs In SWEDISH
(FOA-3-C-3685-E4) Avail: NTIS HC $3.00

Helicopter noise does not appear to have become a matter of great significance despite the use of very much greater horsepower in recent years. In order to obtain a fundamental basis, a program of measurements was carried out which included the part played by power and noise. The sound has been analyzed on a frequency basis. Sounds have also been recorded with associated information for examining the appearance of the pulses. Pulse form and occurrence are discussed hypothetically. Author

N74-12723# Research Inst. of National Defence, Stockholm (Sweden).

REMOTE CONTROL OF AIRCRAFT AND WEAPON SYSTEM USING A NEW METHOD [FJARRSTYRNING AV FLYGPLAN OCH VAPENSYSTEM ENLIGT NY METOD]

Curt Haglund Feb. 1972 16 p In SWEDISH
(FOA-2-A-2553-E4) Avail: NTIS HC $3.00

Remote controlled aircraft can now be maneuvered in a very advanced manner by use of a system for remote sensing and data transference in real time of visual and other information from and to the aircraft. This information in combination with a system for remote operation, makes it possible for a pilot to maneuver the aircraft from a guiding station as if he was in the aircraft. In the U.S.A. this aircraft is called a remotely piloted vehicle (RPV). Development work has been going on for some years and tests with such aircraft have been made. The method can also be used for remote manning of other weapon systems. Author

N74-12724# Sandia Labs., Albuquerque, N.Mex.

ANALYSIS OF DEPLOYMENT AND INFLATION OF LARGE RIBBON PARACHUTES

D. F. McVey and D. F. Wolf 1973 13 p refs Presented at the 4th AIAA Aerodynamic Deceleration Systems Conf., Palm Springs, Calif., 21-23 May 1973 Sponsored by AEC
(SLA-73-5294; Conf-730523-2; AIAA-Paper-73-451) Avail: NTIS HC $3.00

A method for predicting deployment and inflation of reefed ribbon parachutes is presented. The method is based on integration of axial and radial momentum equations developed in the paper. Axial and radial forces are assumed to be describable by drag and radial force coefficients. Computer solutions of the equations are compared to measured parachute loads and to parachute mouth and maximum diameters from tests of 23- and 76-ft diameter conical ribbon parachutes. Comparison of load histories indicates that snatch loads depend to a large extent on deployment bag design and packing influences. Computed loads and parachute size histories for the inflation process compared favorably with flight data. The concept of a radial force coefficient appears to have considerable merit as a means of computing inflation for most types of parachutes. Author (NSA)

N74-12725# Royal Aircraft Establishment, Farnborough (England).

THE IDENTIFICATION OF AIRCRAFT POWERPLANT DYNAMIC RESPONSE FROM FLIGHT TESTS USING POWER SPECTRAL TECHNIQUES

R. B. Lumsden Jul. 1973 46 p refs
(RAE-TR-73049; BR35900) Avail: NTIS HC $4.50

Power spectral techniques were used successfully to identify the transfer function of the Rolls Royce Avon engines in a Comet aircraft from flight results. The transfer function depends on the input to the autothrottle servo but not on the mean thrust level at typical approach settings. A second-order model output determined from spectral analysis was compared with the flight recorded acceleration output using identical input and a good match was found. The new model was incorporated in a Comet glide path autopilot and autothrottle system investigation indicating that the conventional model underestimates throttle activity. A pseudo random binary sequence application to the engine response identification has advantages which include using fairly small perturbations in the normal operating region and obtaining the total frequency response from from one run during which the flight conditions remain constant. Author (ESRO)

N74-12726# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.

STUDY OF STRUCTURAL CRITERIA FOR COMPOSITE AIRFRAMES. VOLUME 3: BIBLIOGRAPHY Final Technical Report

Sherrell D. Manning, Glen H. Lemon, and Innes Bouton (Technology, Inc., Dayton, Ohio) Apr. 1973 117 p refs
(Contract F33615-72-C-1066)
(AD-767569; AFFDL-TR-73-4-Vol-3) Avail: NTIS CSCL 01/3

The current criteria and design practices for aircraft structures are examined and evaluated for applicability to composite structures. Selected probabilistic or statistical rationales are also reviewed and evaluated for possible applications. From these studies a plan was developed for acquiring understanding and data from which structural criteria and design practices applicable to composite airframes may be written. The basic characteristics of filamentary composites which are unique when compared with metallic structure are defined and explored. Special areas investigated include laminates, joints, and cutouts.

Author (GRA)

N74-12727# Air Force Academy, Colo. Dept. of Aeronautics.

VORTEX SHEDDING FROM THE RAM WING VEHICLE Technical Progress Report, Jan. - Jul. 1973

Roger W. Gallington Aug. 1973 37 p refs
(AF Proj. 7905)
(AD-767234; DFAN-TR-73-6) Avail: NTIS CSCL 01/3

Extensive flow visualization of the ram wing surface effect vehicle wake reveals the predominate feature to be a strong vortex sheet shed laterally from the lower side plate edge. This sheet quickly rolls up into a concentrated vortex which continues to move outward parallel to the surface. Neutrally buoyant helium filled bubbles are used for flow visualization supplemented by common techniques. A simple flow model, applicable to low aspect ratio ram wings with side plates, corroborates the major features of observed near wake geometry and conventional force and pressure coefficient data. Minor modifications to the geometry of the side plates are shown to cause large increases in pressure on the bottoms of the side plates. Author (GRA)

N74-12728# Army Air Mobility Research and Development Lab., Fort Eustis, Va.

GENERAL DESCRIPTION OF THE ROTORCRAFT FLIGHT SIMULATION COMPUTER PROGRAM (G-81)

Edward E. Austin and William D. Vann Jun. 1973 60 p refs
(AD-767239; USAAMRDL-TN-11) Avail: NTIS CSCL 01/3

The rotorcraft flight simulation is a multidisciplinary mathematical model that may be used to simulate a wide variety of helicopter or V/STOL aircraft configurations using a digital computer. Aircraft performance, stability and control, and maneuver characteristics, as well as rotor blade loads, may be estimated using this analysis. The fuselage, main rotor, tail rotor, wing, elevator, fin/rudder, jet thrust, and weapon recoil are treated as separate aircraft components, allowing detailed representation of the aircraft for design or detailed analysis applications. Six rigid-body fuselage degrees of freedom and up to six rotor blade elastic degrees of freedom for each of two rotors are accounted for. Input for the simulation is divided into logical blocks in an easy-to-understand format. The rotor blade elastic degrees of freedom are omitted if stiffness and mass properties are not known. Output includes aircraft trim attitude, control positions, performance rotor loads, stability and control characteristics, and detailed maneuver response. (Modified author abstract) GRA

N74-12729# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Materials Directorate.

TECHNIQUES FOR REDUCING THE VIBRATION OF ROCKET LAUNCHERS MOUNTED ON HELICOPTERS

C. D. Johnson 15 Aug. 1972 39 p refs
(DA Proj. 1M2-62303-A-214)
(AD-767237; RL-TR-72-1) Avail: NTIS CSCL 19/7

The report is concerned with various techniques that might be used to achieve high quality vibration isolation for equipment mounted on a helicopter. Of specific interest is the problem of reducing the rotor induced vibration of externally mounted rocket launchers. Three schemes for reducing rocket launcher vibrations are proposed. The first scheme is along the lines of traditional vibration isolation methods. The second scheme uses a novel device called a vibration absorber which (theoretically) can completely eliminate sinusoidal launcher vibrations - provided the vibration frequencies are constant. The third proposed scheme is somewhat newer, and more exotic, and leads to what can be called an active vibration absorber. Author (GRA)

N74-12730# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

PROCEEDINGS OF THE AFCRL SCIENTIFIC BALLOON SYMPOSIUM (7TH), HELD AT PORTSMOUTH, NEW HAMPSHIRE, IN SEPTEMBER 1972

George F. Nolan 3 Jan. 1973 487 p
(AF Proj. 6665)
(AD-767582; AFCRL-TR-73-0071; AFCRL-SR-152) Avail: NTIS CSCL 01C

The report contains the papers presented at the Seventh AFCRL Scientific Balloon Symposium held in September 1972. The papers were presented in three sessions: Tethered and powered balloons, balloon-borne experiments, and instrumentation and balloon technology. In the area of tethered balloons, papers were presented on cables, drag and stability characteristics, hull design and analysis, and the results of scientific experiments using tethered balloons as sensor platforms. Papers were presented on a powered spherical balloon and a survey of possible power sources for use by this system. Presentations during the balloon-borne experiments and instrumentation session included manned balloon flights, precision pointing and control platforms and instrumentation, recovery parachute performance, gondola motion analyses, a balloon radar altimeter, and an overview of French scientific ballooning activities. During the balloon technology session a review was made of the flight results and performance of balloons with volumes in excess of 20 million cubic feet, shape and stress analysis of both nonreinforced and reinforced materials, and fabric tinting to increase solar absorptivity. Author (GRA)

N74-12731# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS), AH-1G 90 DEGREE GEARBOX Interim Report, 1 Jan. 1964 - 30 Jun. 1972

Sep. 1973 32 p
(AD-767540; USAAVSCOM-TR-73-21) Avail: NTIS CSCL 01/3

The report describes a maintenance analysis of a helicopter rotor gearbox. Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distributions can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N74-12732# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS), CH-54A MAIN ROTOR PRIMARY SERVO Interim Report, 1 Jan. 1964 - 31 Dec. 1972

Sep. 1973 30 p refs
(AD-767539; USAAVSCOM-TR-73-22) Avail: NTIS CSCL 01/3

The report describes a maintenance analysis of 2 helicopter main rotor primary servo. The report is designed to illustrate cost savings which would result from specific efforts in the areas of product improvement in quality and design, and extensions of time between overhaul of major items. For the purpose of this study the cost savings produced in the area of product improvement are based on total elimination of a certain failure mode or modes. GRA

N74-12733# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

OPTICAL FACTORS IN AIRCRAFT WINDSHIELD DESIGN AS RELATED TO PILOT VISUAL PERFORMANCE Final Technical Report

Walter F. Grether Jul. 1973 37 p refs
(AF Proj. 7184)
(AD-767203; AMRL-TR-73-57) Avail: NTIS CSCL 01/3

The slope and curvature of aircraft windshields that are optimum for high speed flight cause optical degradation of pilot vision in the forward direction. The report presents a survey of the literature bearing on the conflict between aerodynamic and visual requirements. The optical effects of windshield slope (or angle of incidence) and curvature are reviewed, in terms of displacement, deviation, distortion, binocular deviation, reflections, multiple images, haze, transmission loss, and reduced resolution. Included in the review are discussions of windshield design practices in recent military aircraft, as well as optical standards and tolerance contained in current military specifications. The review also provides a discussion and research data on pilot visual performance as affected by windshield design factors, and a small sample of pilot opinions concerning the visual problems caused by the windshield of the F-111 aircraft. The report concludes with some suggestions for further studies that would assist in making choices concerning windshield design.
Author (GRA)

N74-12734# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

UNSTEADY GAS DYNAMICS PROBLEMS AND AEROELASTIC APPLICATIONS RELATED TO FLIGHT VEHICLES Final Report, 1 Jan. 1968 - 31 Dec. 1972

Holt Ashley and J. Michael Summa Apr. 1973 25 p refs
(Contract F44620-68-C-0036)
(AD-767605; SUDAAR-456; AFOSR-73-1693TR) Avail: NTIS CSCL 01/3

The report reviews the accomplishments made during the period of five years from 1 January 1968 through 31 December 1972 at Stanford University in a program of research on unsteady aerodynamics related to flight vehicles, and on associated aeroelastic problems. Over 20 reports have been completed during the course of the research with the purpose to improve analysis and design of high-performance aircraft. The impact on the scientific and engineering community of research done under this project has been significant and is a measure of important contributions supported by AFOSR. (Modified author abstract)
GRA

N74-12735# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.

INVESTIGATION OF THE MANEUVERABILITY OF THE S-67 WINGED HELICOPTER Final Report

Robert A. Monteleone Jul. 1963 72 p refs
(Contract DAAJ02-71-C-0008; DA Proj. 1F1-63204-D-157-04)
(AD-767559; SER-67008; USAAMRDL-TR-73-51) Avail: NTIS CSCL 01/3

A flight test program and a computer simulation study have been conducted to evaluate the maneuverability and speed capability of the S-67 as a representative winged helicopter design. The flight program evaluated the effects on load factor capability of wings and of variations in gross weight, center of gravity, stabilator bias angle, and type of maneuver. The computer simulation determined the effects of stabilator linkage changes, of several control system feedbacks, and of differential speed brake application for roll control. Program results show that helicopter maneuverability can be improved by the addition of wings. Main rotor control system loads were the limiting factor on maneuver capability of the S-67. Control load buildup is minimized when rotor torque is low. Wings increased speed

capability somewhat by delaying rotor stall effects. The dynamic stability of the S-67 satisfies MIL-H-8501A requirements above 100 knots. Author (GRA)

N74-12736# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT FROM 1 JANUARY 1962 TO JULY 1973 Semiannual Summary Report
Thomas A. DeFiore 1 Nov. 1973 134 p refs
(AD-767648) Avail: NTIS CSCL 01/3

The report is a specialized summary of normal acceleration data recorded by counting accelerometers. Data are separated by calendar time and mission category. Only data reported in the counting accelerometer program are included. Author (GRA)

N74-12737# Decision Science, Inc., San Diego, Calif.
INVESTIGATION OF PRINCIPLES OF CONTROL AND DISPLAY FOR RPVs Semiannual Technical Report, Feb. - Aug. 1973
Lawrence J. Fogel, Carl E. Englund, Michael L. Mout, and Thomas D. Hertz Aug. 1973 128 p refs
(Contract N00014-72-C-0196)
(AD-767414; DSI-ONR-TR-73-1) Avail: NTIS CSCL 01/3

The purpose of this investigation was to definitize principles of display and control suitable for remotely piloted vehicles of interest to the Navy. The immediate concern is directed toward RPV strike missions wherein an aircraft will be used to deliver conventional or laser-guided weapons to highly defined targets, recover and seek further targets, then return to friendly territory. The report includes a brief discussion of the prior research conducted pertinent to this problem by Decision Science, Inc., a general research plan for the current investigation and preliminary statements regarding the first of a series of display control experiments. A bibliography is included as well as appendices which cover detailed materials used in support of this research effort. GRA

N74-12738# Boeing Vertol Co., Philadelphia, Pa.
A MATHEMATICAL MODEL OF UNSTEADY AERODYNAMICS AND RADIAL FLOW FOR APPLICATION TO HELICOPTER ROTORS Final Report, May 1971 - Jul. 1972
Ronald E. Gormont May 1973 150 p refs
(Contract DAAJ02-71-C-0045; DA Proj. 1F1-62204-AA-41)
(AD-767240; D210-10492-1; USAAMRDL-TR-72-67) Avail: NTIS CSCL 01/3

The report documents the development of a mathematical model which represents force coefficients acting on an airfoil in an unsteady environment. In addition, the model is extended to account for the three-dimensional effects of radial flow experienced by rotor blade sections. The methods developed in this report are aimed at obtaining improved capability for predicting rotor blade section force coefficeints, particularly at or above stall conditions. The mathematical model has been incorporated into the Government's rotorcraft flight simulation program C-81 (AGAJ71 version). The mathematical model was correlated with two-dimensional oscillating airfoil test data, and the Government's rotorcraft flight simulation program C-81 (AGAJ71 version) was correlated with full scale and model rotor test data. The results of the correlation indicate substantial improvement in rotor prediction capability at high speeds and rotor thrust coefficients above stall. Author (GRA)

N74-12739# Goodyear Aerospace Corp., Litchfield Park, Ariz.
DESIGN, TEST, AND ACCEPTANCE CRITERIA FOR ARMY HELICOPTER TRANSPARENT ENCLOSURES Final Technical Report
Harold C. James, Allen O. Ingelse, and Richard A. Huyett May 1973 142 p refs
(Contract DAAJ02-72-C-0074; DA Proj. 1F1-62205-A-119)
(AD-767242; GERA-1864; USAAMRDL-TR-73-19) Avail: NTIS CSCL 01/3

The high cost of replacement of helicopter transparencies is of serious concern to the U.S. Army. A recent study of 412 windshield replacement actions revealed that the average replacement occurred every 307 flying hours. As a result of this concern, the Army contracted for a systematic study of the design, test, and acceptance criteria for helicopter transparent structures to improve the overall reliability and maintainability of these transparencies. Data were collected and analyzed; existing criteria were evaluated for effectiveness and relative importance for different classes of helicopters; and recommendations have been made for detailed design objectives, testing, and acceptance criteria. The data collection on which these recommendations were based include both objective and subjective data. Extensive interviews with operational and maintenance personnel provide a broad real-world basis for evaluation of the statistical tabulations of transparency replacement actions. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-12740*# Hamilton Standard, Windsor Locks, Conn.
HYDROGEN DEPOLARIZED CARBON DIOXIDE CONCENTRATOR PERFORMANCE IMPROVEMENTS AND CELL PAIR STRUCTURAL TESTS
J. D. Huddleston and J. R. Aylward Sep. 1973 301 p refs
(Contract NAS9-12920)
(NASA-CR-134159; SVHSER-6285) Avail: NTIS HC $17.25 CSCL 10A

The investigations and testing associated with the CO2 removal efficiency and voltage degradation of a hydrogen depolarized carbon oxide concentrator are reported. Also discussed is the vibration testing of a water vapor electrolysis cell pair. Performance testing of various HDC cell pairs with Cs2CO3 electrolyte provided sufficient parametric and endurance data to size a six man space station prototype CO2 removal system as having 36 HDC cell pairs, and to verify a life capability exceeding six moths. Testing also demonstrated that tetramethylammonium carbonate is an acceptable HDC electrolyte for operating over the relative humidity range of 30 to 90 percent and over a temperature range of 50 to 80 F. Author

N74-12741*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCELERATED TEST PLAN FOR NICKEL CADMIUM SPACECRAFT BATTERIES
Thomas J. Hennigan Oct. 1973 52 p refs
(NASA-TM-X-70524; X-761-73-183) Avail: NTIS HC $4.75 CSCL 10C

An accelerated test matrix is outlined that includes acceptance, baseline and post-cycling tests, chemical and physical analyses, and the data analysis procedures to be used in determining the feasibility of an accelerated test for sealed, nickel cadmium cells. Author

N74-12742# Pratt and Whitney Aircraft, East Hartford, Conn.
AIR MOBILITY FUEL CELL STUDY Technical Report, 9 May 1972 - 9 Jan. 1973
Jeffrey H. Arnold Kirtland AFB, N. Mex. AFWL Jul. 1973 96 p refs
(Contract F29601-72-C-0083; AF Proj. 683M)
(AD-766757; PWA-4635; AFWL-TR-73-26) Avail: NTIS CSCL 10/2

An analytical and test program was conducted to evaluate the fuel cell power concept for the Bare Base mission which was selected as an example of an air mobility application. A life cycle cost model was developed and the life cycle costs of candidate fuel cell power systems were compared to the present Bare Base centralized power system. A study and test program was conducted to determine the feasibility of desulfurizing military JP-4 fuel and a powerplant test program was also conducted to evaluate operation on JP-4 fuel to meet typical air mobility loads. Study results verified that dispersed fuel cell power systems offer potential operational advantages in system installation, operation, and maintenance and are economically competitive with existing centralized power systems. The

desulfurizer test program demonstrated the feasibility of desulfurizing JP-4 fuel. Powerplant tests demonstrated the capability to operate on JP-4 fuel and the ability to provide power compatible with air mobility loads. A comprehensive field experiment was planned as a logical next step to confirm the economic and operational conclusions of the study and provided detailed design information for an air mobility fuel cell system. Author (GRA)

N74-12743# Union Carbide Corp., Cleveland, Ohio. Consumer Products Div.
LOW COST OXYGEN ELECTRODES Interim Report, 30 Jul. 1972 - 31 Jan. 1973
K. V. Kordesch Mar. 1973 53 p refs
(Contract DAAK02-71-C-0297; DA Proj. 1T6-61102-A-34A) (AD-766773; IR-3) Avail: NTIS CSCL 07/1

The purpose of the research is the development of a low cost air electrode for medium temperature (130C) immobilized phosphoric acid (matrix) fuel cell. For this report the performance goal was 100 mA/sq cm at 0.6 v terminal voltage for 1500 hours with 1-2 mg Pt/sq cm. To achieve this a study of the various cell and electrode polarization components was made to find the limiting parameters. Screening of commercially available inexpensive support materials was continued. Different active carbon materials were tested as catalyst carriers. New electrode manufacturing techniques were investigated because it was found that catalyst distribution and the layering of the support material with active carbon needed more attention. (Modified author abstract) GRA

N74-12744# Pratt and Whitney Aircraft, East Hartford, Conn.
THE 1.5-kW FUEL CELL POWERPLANT Final Report, 1 Jul. 1971 - 31 Dec. 1972
Anthony J. DeCasperis and H. Leigh Ferguson 2 Apr. 1973 119 p refs
(DA Proj. 1G6-63702-DG-10; Contract DAAK02-70-C-0518) (AD-767302; PWA-4704) Avail: NTIS CSCL 10/2

Four advanced development model 1.5kW fuel cell power plants were delivered to the Army for evaluation. The delivery configuration power plant weighs 292 lbs. and has a volume of 9.7 cubic feet. Startup and Operation are fully automatic and the power plant operates on JP-4 fuel with a specific fuel consumption of less than 2.2 lbs/kWh. Output voltage is adjustable from 26 to 34 volts at any output from 0 to 1.5kW. The power plant consists of four subsystems, a regenerative thermal cracker, which converts logistic fuel to hydrogen, an acid fuel cell power section which generates dc power from hydrogen and air, a voltage regulator and an automatic control system. A core technology program was conducted to develop the cracker voltage regulator and automatic control unit. Limited development of the power section, which is based on commercial technology fuel cells, to tailor the design to Army requirements was also conducted. The program culminated with development testing of a complete power plant and delivery of four power plants to the Army. Author (GRA)

N74-12745# GTE Labs., Inc., Waltham, Mass.
LITHIUM BATTERY WITH INORGANIC ELECTROLYTE Final Report, 1 Dec. 1971 - 31 May 1973
James J. Auborn, Kenneth W. French, Adam Heller, and Sheldon Lieberman Sep. 1973 62 p refs
(Contract DAAB07-72-C-0060)
(AD-767624; TR-73-845-1; ECOM-0060-F-72) Avail: NTIS CSCL 10/2

A series of lithium anode electrochemical cells using inorganic oxyhalides as solvents for the electrolytic solutions have been operated at room temperature. Lithium metal can be electrodeposited from these solutions accompanied by the simultaneous electrogeneration of chlorine at the positive electrode. The resulting lithium/chlorine electrochemical cell has an open circuit voltage in excess of 4 volts. A group of halogen/platinum, halogen/graphite, nonmetallic and metallic cathode systems are described. The solvents themselves, while stable to lithium metal and strong oxidants such as chlorine, can be electrochemically reduced at various catalytic surfaces (such as carbon) and act as cathode depolarizers. This electrochemical reduction of the solvent results in cells with extremely stable voltages and high-energy densities in excess of 500 Wh/kg. GRA

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-12746 British Library Lending Div., Boston Spa (England).
CLAUSTROPHOBIA, PHOTOPHOBIA AND NYCTALOPHOBIA
M. Deribere 3 Sep. 1973 5 p Transl. into ENGLISH from Trav. Souterrains (France), v. 10, no. 161, Jan./Mar. 1970 p 37-38
(BLL-OA-Trans-871-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Aspects of claustrophobia, photophobia, and nyctalophobia in relation to the astronaut in his interplanetary capsule are discussed. Phobias are classified as anxiety neuroses originating in the agression by the environment on the psyche of the inidividual, also considered as environmental stress. Claustrophobia is the pathological fear of confined places, photophobia the fear of too much light, and nyctalophobia a fear of the night. G.G.

N74-12747 Texas A&M Univ., College Station.
MEASUREMENT AND ANALYSIS OF GLARE RECOVERY Ph.D. Thesis
Ronald Scott Morris 1973 165 p
Avail: Univ. Microfilms Order No. 73-21685

Glare recovery is defined as the visual phenomenon associated with the return of retinal sensitivity to the pre-glare level after a short duration exposure to intense light. Experimentation with an existing glare recovery testing device and a TV pupillometer resulted in the development of a new test apparatus which is described in this dissertation. The device utilizes psycho-physical responses by the test subject before and after a glare exposure to measure the relative visual degradation occurring before glare recovery is complete. Comparison of data collected on subjects with slight visual abnormalities and corrected vision to that collected on normal subjects showed marked differences. Most subjects with visual defects maintained a considerably longer period of visual instability during the third phase of recovery and a longer duration initial phase. Dissert. Abstr.

N74-12748# Advisory Group for Aerospace Research and Development, Paris (France).
SPATIAL DISORIENTATION IN FLIGHT: A HANDBOOK FOR AIRCREW
A. J. Benson (RAF Inst. of Aviation Med.) and E. Burchard (German AF Med. Corps.) Sep. 1973 43 p refs
(AGARD-AG-170) Avail: NTIS HC $4.25

It has been known for many years that aircrews/suffer from false sensations and perceptions of aircraft motion and that these illusions may hazard the safety of the aircraft and its occupants. This handbook considers the various manifestations of spatial disorientation, their causes and consequences for the benefits of aircrews and their medical attendants. Author

N74-12749# McGill Univ., Montreal (Quebec). DRB Aviation Medical Research Unit.
DRB AVIATION MEDICAL RESEARCH UNIT REPORTS, VOLUME 3, 1971 - 1973
G. Melvill Jones, comp. and G. Mandl, comp. Ottawa Def. Res. Board Oct. 1973 264 p refs Sponsored by Def. Res. Board
(DR-220) Avail: NTIS HC $15.25

The vestibular contribution to orientation in aerospace flight environments is considered with emphasis on neural mechanisms implicated in visual perception. Also studied are sensorimotor aspects of human postural and locomotor contrcl. For individual titles, see N74-12750 through N74-12768.

N74-12750 McGill Univ., Montreal (Quebec).
FREQUENCY RESPONSE ANALYSIS OF CENTRAL VESTIBULAR UNIT ACTIVITY RESULTING FROM ROTATIONAL STIMULATION OF THE SEMICIRCULAR CANALS
G. Melvill Jones and J. H. Milsum *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 1-24 refs

Repr. from the J. Physiol. (London), no. 219, 1971 p 191-215 (For availability see N74-12749 04-04)
(AMRU-R.71:4)

The neural response of semicircular canal-dependent units in the vestibular nuclei of cats has been examined over a frequency range of sinusoidal rotation extending from 0.004 to 0.9 Hz. Frequency response analysis indicates that the information contained in the neural signal received by the brain stem was similar to that expected from the mechanical end organ. The relation between neural response and mechanical stimulus was dominated by a single time constant of about 4 sec, such that two response regions can be defined above and below a stimulus frequency of 1/4 rad/sec. Above this frequency the information content of the neural signal tends towards that of angular velocity and below that frequency it tends towards that of angular acceleration. Author

N74-12751 McGill Univ., Montreal (Quebec).
TRANSFER FUNCTION OF LABYRINTHINE VOLLEYS THROUGH THE VESTIBULAR NUCLEI
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 25-44 refs Repr. from Progr. Brain Res. (Netherlands), vol. 37 Presented at Symp. on Basic Aspects of Central Vestibular Mechanisms, 1972 (For availability see N74-12749 04-04)
(AMRU-R.72:1)

Simple analysis of canal hydrodynamics yields a second order linear differential equation which is re-stated as a transfer function. An experimental study of action potential frequencies induced in central vestibular units by rotational stimulation of the canals yields a similar transfer function. It is inferred that the nervous system transfers the canal response signal to the brain stem with generally good fidelity. In particular it is shown that, over a middle range of frequencies, probably corresponding to those encountered in natural life, the informational content of this signal essentially corresponds to that of head angular velocity. Adjustment of canal frequency response according to animal size is apparently brought about by precise, but very small, changes in canal dimension from one species to another. Author

N74-12752 McGill Univ., Montreal (Quebec).
REFLEX VESTIBULAR CONTROL OF HEAD MOVEMENTS IN MAN
J. S. Outerbridge and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 45-55 refs Repr. from Aerosp. Med., v. 42, 1971 p 935-940 (For availability see N74-12749 04-04)
(AMRU-R.71:5)

Vestibularly driven head movement was examined in seated human subjects exposed to sinusoidal and stepwise changes in rotational velocity about a vertical axis. In the absence of vision nystagmoid head movements occurred, but not in all subjects. Slow phase head velocity showed less phase advance during slow sinusoidal stimulation than corresponding vestibulo-ocular response, and made a substantial contribution to ocular stabilization in the period immediately following a step change in rotational velocity. The practical and theoretical significance of these findings is discussed. Author

N74-12753 McGill Univ., Montreal (Quebec).
INVESTIGATION OF HABITUATION TO ROTATIONAL STIMULATION WITHIN THE RANGE OF NATURAL MOVEMENT
A. Gonshor and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 56-57 refs Repr. from the Proc. of the Ann. Sci. Meeting of the Aerospace Med. Assoc., San Francisco, 1969 (For availability see N74-12749 04-04)
(AMRU-R.69:4)

It is shown experimentally that repeated exposure to patterns of rotational stimulation within the range of natural experience, without the aid of vision, does not produce systematic changes of response called habituation in humans. Author

N74-12754 McGill Univ., Montreal (Quebec).
VESTIBULAR HABITUATION INDUCED BY MIRROR-VISION: AN OPTIMIZING PROCESS?
A. Gonshor and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 60-62 refs Repr. from the Proc. of the Ann. Sci. Meeting of the Aerospace Med. Assoc., Houston, Tex., 1971 (For availability see N74-12749 04-04)
(AMRU-R.71:6)

It is shown experimentally that repeated exposure to unnatural patterns of movement such as prolonged unidirectional rotational stimulation is associated with systematic changes of visual response often called habituation. It is concluded that habituation is induced not by maintained vestibular stimulation per se, but by making that stimulation actively oppose the eye movement required for retinal image stabilization. It seems that habituation is not merely long term adaptation to any maintained sensory stimulus but rather a manifestation of a general tendency in the CNS to meet new optimization criteria when the need arises. Author

N74-12755 McGill Univ., Montreal (Quebec).
EXTREME VESTIBULAR HABITUATION TO LONG TERM REVERSAL OF VISION DURING NATURAL HEAD MOVEMENTS
G. Melvill Jones and A. Gonshor *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 63-65 refs Repr. from the Proc. of the Ann. Sci. Meeting of the Aerospace Med. Assoc., Bal Harbour, 1972 (For availability see N74-12749 04-04)
(AMRU-R.72:2)

Human vestibular ocular reflex gain during long term mirror reversed vision in prolonged sinusoidal rotation showed a rapid reduction during the first two days of experiments. After 4 days the gain became negative. In a 28 day experiment this reversal became progressively more marked, reaching a gain of minus 0.3 by the 28th day, compared with the normal pre-experimental gain of plus 0.6. It is concluded that habituation represents the functional reorganization of central neural networks to meet optimization criteria set by new environmental conditions. G.G.

N74-12756 McGill Univ., Montreal (Quebec).
ERRONEOUS PERCEPTION OF VERTICAL MOTION BY HUMANS SEATED IN THE UPRIGHT POSITION
Richard Malcolm and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 66-80 refs Submitted for publication (For availability see N74-12749 04-04)
(AMRU-R.73:1)

The reliability of subjective response to vertical linear accelerations in the absence of vision has been examined in human subjects seated in the upright position. Helicopters and a vertical movement simulator were used to generate sinusoidal vertical movement of period 2-10 sec and acceleration amplitude 0.2 - 0.4 g. Subjective response was recorded as a continually variable assessment of vertical position. Without prior knowledge of the movement pattern, subjects were aware of movement but registered its form with a performance little better than chance. Light to moderate simulated turbulence did not significantly alter performance. Detailed consideration of end-organ orientation in the skull suggests the possibility that relative paucity of vestibular afferent information about vertical movement may account at least in part for the poor tracking performance observed in these experiments. Author

N74-12757 McGill Univ., Montreal (Quebec).
NYSTAGMOGRAPHY: A USEFUL TOOL IN BASIC AND APPLIED INVESTIGATIONS
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 81-99 refs Repr. from AGARD-CPP-128 (For availability see N74-12749 04-04)
(AMRU-R.73:2; AGARD-CPP-128)

There are many recognized patterns of eye movement ranging from very small high frequency oscillations, to large changes in gaze direction. Relatively gross eye movements are considered in quick saccadic, gaze shifts from one fixation point to another, and in relatively slow smooth pursuit movements associated with following a fixation point which is moving relative to the head. In many circumstances these two types of movement are integrated to produce a combined pattern of eye movement suitable for intermittent fixation on a visual field which is moving relative to the head. This integrated pattern of smooth pursuit

movements, interspersed with quick repositioning saccades, is defined here as Nystagmus. Methods of recording nystagmus and its data reduction are discussed, together with their applicability and hazards, in relation to intended objectives.
Author

N74-12758 McGill Univ., Montreal (Quebec).
THE COLOUR SPECIFICITY OF SPATIAL ADAPTATION: RED-BLUE INTERACTIONS
C. R. Sharpe *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 100-123 refs Submitted for publication (For availability see N74-12749 04-04)
(AMRU-R.73:6)

Results obtained from human psychophysical experiments have shown that spatially adapting to a sinusoidal grating of one color can significantly elevate the contrast threshold of another test grating of a different color. It is proposed that this cross color spatial adaptation is the aftereffect of prolonged inhibition between spatial pattern detectors. Cross color spatial adaptation is found to be interocularly transferred to a significantly greater extent than same color adaptation, suggesting that the former occurs at a more central stage in the visual pathway. Both same color and cross color spatial adaptation are found to be spatial frequency specific. It is proposed that spatial frequency tuning curves determined by cross color spatial adaptation represent the extent of inhibitory input to the detectors responsible for detecting the test gratings, from those detectors stimulated by the adapting grating.
Author

N74-12759 McGill Univ., Montreal (Quebec).
THE EFFECT OF FRONTAL EYE FIELD STIMULATION OF UNIT RESPONSES IN THE SUPERIOR COLLICULUS OF THE CAT
D. Guitton and G. Mandl *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 124-131 refs Submitted for publication (For availability see N74-12749 04-04)
(AMRU-R.73:7)

Effects of excited units in the frontal eye field on visually evoked responses of movement sensitive cells in the superior colliculus of the cat are studied. Results show that units unresponsive to visual stimulation can be influenced at short latency by frontal eye field stimulation; they are located 2-3 mm below the superior colliculus surface. Units that respond to both visual and electrical front field stimulation are generally situated more superficially. The influence of electrical front field stimulation on visual responses depends on the relative timing between the two modes of stimulation. It is concluded that a neural discharge originating in the frontal eye field and arriving at the superior colliculus after an eye movement, cannot operate as a corollary discharge.
G.G.

N74-12760 McGill Univ., Montreal (Quebec).
THE INFLUENCE OF VISUAL PATTERN COMBINATIONS ON RESPONSES OF MOVEMENT SENSITIVE CELLS IN THE CAT'S SUPERIOR COLLICULUS
G. Mandl *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 132-166 refs Submitted for publication (For availability see N74-12749 04-04)
(AMRU-R.73:8)

The responses of 41 single neurons in the superior colliculi of 18 cats were recorded with extracellular microelectrodes. Eighteen units were tested for variations in directional selectivity and/or orientation preference, and 25 units for variations in velocity preference, when one moving pattern was substituted for another. Eleven units were tested for variations in excitability when movement of one pattern relative to another was substituted for the movement of a single pattern only. Twenty-five units (61%) showed a change in at least one of their response characteristics when tested with different patterns or pattern combinations. It is suggested that the subjectively perceived velocity of an object moving in the visual field depends to a significant degree on the number, and the configuration, of moving and non-moving objects present.
Author

N74-12761 McGill Univ., Montreal (Quebec).
IS THERE A VESTIBULO-SPINAL REFLEX CONTRIBUTION TO RUNNING?
G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 167-172 refs Repr. from Adv. Oto-Rhino-Laryng., v. 20, 1972 p 168-174 (For availability see N74-12749 04-04)
(AMRU-R.71:7)

It is inferred that despite relatively low vestibular sensitivity to vertical linear acceleration with head erect, there may well be a significant vestibulo-spinal contribution to the neuromuscular control of human running.
Author

N74-12762 McGill Univ., Montreal (Quebec).
OBSERVATIONS ON THE CONTROL OF STEPPING AND HOPPING MOVEMENTS IN MAN
G. Melvill Jones and D. G. D. Watt *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 173-190 refs Repr. from J. Physiol. (London), no. 219, 1971 p 709-729 (For availability see N74-12749 04-04)
(AMRU-R.71:7)

The presence of a form of stretch reflex has been confirmed in the gastrocnemius muscle of the human leg. The electromyographic manifestation of this reflex occurred 120 msec following a sharply applied, and maintained, dorsiflexing force to the foot. The e.m.g. activity in the above muscle was monitored during single downward steps of 12.7, 25.4 and 38.1 cm and during repetitive, rhythmic, hopping movements on one foot. It was found that e.m.g. activity associated with steps to the ground began 141 msec before contact with the ground and ended 131 msec after contact, when the e.m.g. usually became temporarily inactive. It is inferred from these results that the muscular deceleration associated with landing was brought about by the release of a pre-programmed pattern of neuromuscular activity which was inaccessible to reflex activity resulting from the mechanical event of landing, rather than by a stretch reflex.
Author

N74-12763 McGill Univ., Montreal (Quebec).
MUSCULAR CONTROL OF LANDING FROM UNEXPECTED FALLS IN MAN
G. Melvill Jones and D. G. D. Watt *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 191-199 refs Repr. from J. Physiol. (London), no. 219, 1971 p 729-737 (For availability see N74-12749 04-04)
(AMRU-R.71:8)

Subjects were dropped from an electromagnetic suspension at unexpected moments and their gastrocnemius electromyographic (e.m.g.) responses and the forces applied to their feet were recorded throughout. No useful contribution of a stretch reflex response was detected. Indeed, it was shown that a functionally effective reflex resulting from the mechanical event of landing would occur far too late to contribute to the muscular deceleration of the fall. It was also found that a consistent muscular response occurred, commencing 74.2 msec after starting the fall, independent of height. It is suggested that this response in the leg musculature is a reflex originating in the otolith apparatus. In addition, a possible mechanism for the control of repetitive hopping, and perhaps running, movements, involving the above reflex, is suggested.
Author

N74-12764 McGill Univ., Montreal (Quebec).
ON THE CONTROL OF POSTURAL MUSCLES DURING SOME NATURAL HUMAN MOVEMENTS
G. Melvill Jones and D. G. D. Watt *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 200-209 refs Repr. from Intern. Congr. Ser. No. 253 (For availability see N74-12749 04-04)
(AMRU-R.72:4)

The significance of the functional stretch reflex in the gastrocnemius muscle was investigated during the natural human movements of stepping to the ground and repetitive hopping. It was shown that all electromyographic activity in the gastrocnemius concerned with the control of landing from a single step to the ground was completed before the FSR had a chance to contribute. During repetitive hopping while the landing phase of each hop appeared to be similarly preprogrammed, the take-off phase was timed in such a way as to make use of the FSR. The possibility of the FSR being a long loop reflex is discussed, and some evidence is given to support this hypothesis.
Author

N74-12765 McGill Univ., Montreal (Quebec).
IS THE LATE RESPONSE TO MUSCLE STRETCH IN MAN MEDIATED THROUGH A LONG-LOOP REFLEX PATHWAY?
D. G. D. Watt, Christina W. Y. Chan, and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 210-222 refs (For availability see N74-12749 04-04)
(AMRU-R.73:4)

To demonstrate the presence of a long loop response originating in muscle afferent fibres in human subjects, a form of stretch reflex was compared in biceps and gastrocnemius. By subtracting the monosynaptic response time from the latency of the functional stretch reflex, a measure of the time required for conduction within the central nervous system was determined at each segmental spinal level. It was found that while the central conduction time for biceps was 33 msec, that for gastrocnemius was 74 msec, a highly significant difference. In addition, it was found that the central conduction time for quadriceps fell between that of biceps and gastrocnemius. It is inferred that the later response to muscle stretch is mediated at least in part through a long loop reflex pathway. Author

N74-12766 McGill Univ., Montreal (Quebec).
DO MUSCLE AFFERENTS CONTRIBUTE TO LONG-LOOP REFLEXES IN MAN?
C. W. Y. Chan, G. Melvill Jones, and R. F. H. Catchlove *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 223-231 refs (For availability see N74-12749 04-04)
(AMRU-R.73:5)

Muscular response to stretch has been termed the Functional Stretch Reflex (FSR). Experiments were undertaken to investigate the relative contributions of muscle and other afferents to the FSR. In each of ten subjects, complete anesthesia of the ankle and foot was obtained by intravenous regional anesthesia. The MSR to a sharp tap on the Achilles' tendon and the FSR to a suddenly applied and maintained dorsiflexing force to the sole of the foot were recorded by surface emg from the gastrocnemius before, during and after full recovery from regional anesthesia. The results showed no significant change in mean latency of the MSR; the respective mean latencies of the FSR were indistinguishable from one another, as were their response amplitudes. It is therefore concluded that the observed FSR probably originated predominantly from muscle afferents. In conjunction with other current results, it is inferred that these muscle afferent signals mediate their influence at least in part through long loop central pathways. Author

N74-12767 McGill Univ., Montreal (Quebec).
DYNAMIC CHARACTERISTICS OF SACCADIC EYE MOVEMENTS IN PARKINSON'S DISEASE
G. Melvill Jones and J. David DeJong *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 232-246 refs Repr. from Exp. Neurol., v. 31, 1971 p 17-31 (For availability see N74-12749 04-04)
(AMRU-R.71:9)

Detailed characteristics of saccadic eye movements in 14 Parkinsonian patients were compared with those in 12 age matched controls. The subjects were required to follow the sudden, randomly timed, stepwise change in position of a visual fixation point through 25 deg. Eye movements were recorded by d-c electrooculography. The following characteristics of individual saccades were measured: amplitude, duration, maximum velocity, times to accelerate to and decelerate from maximum velocity, duration between successive corrective saccades, latency of response. The results showed that the patients had an abnormal tendency to make small saccades followed by one or more corrections, but that all the other measured characteristics were essentially normal. It is inferred that in these patients the peripheral oculomotor system examined was functionally normal and the centrally coordinated neural programs controlling the observed movements were normal for the amplitudes of saccades achieved. Author

N74-12768 McGill Univ., Montreal (Quebec).
AKINESIA, HYPOKINESIA AND BRADYKINESIA IN THE OCULOMOTOR SYSTEM OF PATIENTS WITH PARKINSON'S DISEASE
J. David DeJong and G. Melvill Jones *In its* DRB Aviation Med. Res. Unit Rept., Vol. 3, 1971 - 1973 Oct. 1973 p 247-257 refs Repr. from Exp. Neurol., v. 32, 1971 p 58-68 (For availability see N74-12749 04-04)
(AMRU-R.71:10)

Detailed characteristics of voluntary saccadic eye movement were measured in 14 Parkinsonian patients and 12 age matched controls by d-c electrooculography. Subjects performed rapid, alternating gaze shifts between two fixed visual targets separated horizontally by 25 deg of arc. On average, the patients took about twice as long as the controls to complete a cycle of the alternating task. Since the dynamic characteristics of the patients' saccadic movements were normal for the amplitude achieved, the fault was not due to a reduced ability to make fast, coordinated, muscle movements. The slowed performance was found to be due to two main factors: an increased target fixation time manifest as delayed initiation of voluntary movement, and increased transit time between targets due to the normal delays of about 200 msec between corrective saccades which were necessitated by an abnormal tendency to undershoot the target. The marked akinesia found in this investigation of voluntary eye movements support the previously drawn conclusion that peripheral neuro-muscular components of the oculomotor system are unimpeded by the disease. Author

N74-12769*# Little (Arthur D.), Inc., Cambridge, Mass.
EVALUATION OF POSSIBLE INTERACTION AMONG DRUGS CONTEMPLATED FOR USE DURING MANNED SPACE FLIGHTS Progress Report, Jul. 1972 - Sep. 1973
31 Oct. 1973 127 p refs
(Contract NAS9-12970)
(NASA-CR-134161) Avail: NTIS HC $8.50 CSCL 06O

Possible interactions among drugs contemplated for use during manned spaceflights have been studied in several animal species. The following seven drugs were investigated: nitrofurantoin, chloral hydrate, hexobarbital, phenobarbital, flurazepam, diphenoxylate, and phenazopyridine. Particular combinations included: chloral hydrate, hexabarbital or flurazepam with nitrofurantoin; phenobarbital or flurazepam with phenazopyridine; and diphenoxylate with two does formulations of nitrofurantoin. Studies were carried out in several species to determine whether induction of liver microsomal enzymes would increase the tendency of phenazopyridine to produce methemoglobin in vivo. Animals were premedicated with phenobarbital, a known inducer of azoreductase, and in a separate experiment with flurazepam, before administration of phenazopyridine. Methemoglobin production was determined in each animal after receiving phenazopyridine. No evidence was found for increased production of methemoglobin in the rat, dog, or rabbit that could be attributed to increased amounts of microsomal enzymes. Author

N74-12770*# Georgetown Univ., Washington, D.C. Dept. of Biology.
THE EFFECTS OF STRESS ON THE ENZYMES OF PERIPHERAL LEUKOCYTES Final Report, 1 Jul. 1969 - 30 Jun. 1973
Esther M. Leise and Irving Gray Jul. 1973 4 p refs
(Contract NGR-09-009-024)
(NASA-CR-136221) Avail: NTIS HC $3.00 CSCL 06S

Previous work showed an early response of rabbit and human leukocyte enzymes to the stress of bacterial infection. Since these represented a mixed population of leukocytes and since polymorphonuclear leukocytes (PMN) increased in these preparations, it was necessary to establish whether the observed increase in lactate dehydrenase (LDH) and protein was the result of an increase in any one particular cell type or in all cells. The need for the development of a simple reproducible method for the differential separation of peripheral leukocytes for the furtherance of our own studies was apparent. It was also becoming increasingly apparent that morphologically similar cells, such as small lymphocytes (L) and macrophages, were capable of different biological functions. A dextran gradient centrifugation method was developed which has provided an easily reproducible technique for separating L from PMN. During the course of this work, in which over 250 rabbits were examined, the pattern of daily leukocyte protein and enzyme variation became increasingly more apparent. This information could have some impact on future work with leukocyte enzymes, by our group and by other workers. The differences in normal protein and enzyme levels

maintained by some individuals, and some inbred strains, were evaluated and reported separately. It has been shown that one type of leukocyte may react more to a given stress than other leukocytes. Author

N74-12771*# Stanford Univ., Calif. School of Medicine.
SUBCELLULAR LOCALIZATION OF PITUITARY ENZYMES Final Progress Report
Robert E. Smith Aug. 1970 16 p refs
(Grant NGL-05-020-177)
(NASA-CR-136206) Avail: NTIS HC $3.00 CSCL 06P

A cytochemical procedure is reported for identifying subcellular sites of enzymes hydrolyzing beta-naphthylamine substrates, and to study the sites of reaction product localization in cells of various tissues. Investigations using the substrate Leu 4-methoxy-8-naphthylamine, a capture with hexonium pararosaniline, and the final chelation of osmium have identified the hydrolyzing enzyme of rat liver cells; this enzyme localized on cell membranes with intense deposition in the areas of the parcanaliculi. The study of cells in the anterior pituitary of the rat showed the deposition of reaction product on cell membrane; and on the membranes of secretion granules contained within the cell. The deposition of reaction product on the cell membrane however showed no increase or decrease with changes in the physiological state of the gland and release of secretion granules from specific cells. Author

N74-12772# Scientific Translation Service, Santa Barbara, Calif.
THE EFFECTS OF NOISE ON GENERAL IMMUNOLOGICAL REACTIVITY
M. L. Khaymovich [1973] 5 p refs Transl. into ENGLISH from Gig. i Sanit. (USSR), v. 38, no. 2, Feb. 1973 p 96-98 Sponsored by EPA
(HS-98) Avail: NTIS HC $3.00

The presence among cutting-workers of a large number of persons who react negatively to the injection of serum as well as the increased number in proportion to longer work experience, indicate that noise leads to a reduction general immunological reactivity of the organism and this, in turn, is expressed in a higher sick rate. Author

N74-12773*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY QUARANTINE COMPUTER APPLICATIONS
M. Rafenstein 15 Dec. 1973 65 p
(Contract NAS7-100)
(NASA-CR-136220; JPL-TM-33-661) Avail: NTIS HC $5.25 CSCL 06M

The computer programs are identified pertaining to planetary quarantine activities within the Project Engineering Division, both at the Air Force Eastern Test Range and on site at the Jet Propulsion Laboratory. A brief description of each program and program inputs are given and typical program outputs are shown. Author

N74-12774# Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL STUDIES CONCERNING THE EFFECTS OF AUTOMOBILE EXHAUST GAS ON LIVING ORGANISMS, CONCERNING THE EFFECTS OF LOW-CONCENTRATION NITROGEN DIOXIDE ON LIVING ORGANISMS
Feb. 1973 29 p Transl. into ENGLISH from Kogai shiryo (Yokohama), Mar. 1970 Sponsored by EPA
(TR-405-73; APTIC-26616) Avail: NTIS HC $3.50

Animals continuously exposed to nitrogen dioxide at extremely low concentration were studied for its effect on their growth and physical strength, on blood properties, and on lung tissues. Histamine measurements, lung moisture content determinations, and physical strength and body weight observations established harmful effects in the respiratory organs. Lung histamine content with time of exposure, and pronounced increases in lung weight and lung histamine content indicated increased irritation by nitrogen dioxide exposure. G.G.

N74-12775# Aerospace Corp., El Segundo, Calif.
PRELIMINARY CORNEAL DAMAGE THRESHOLD STUDIES WITH HF-DF CHEMICAL LASERS Technical Report, Feb. - Mar. 1972
Donald J. Spencer and Irving L. Dunsky 15 Jul. 1973 26 p refs
(Contract F04701-73-C-0074)
(AD-766255; TR-0074(4240-10)-4; SAMSO-TR-73-215) Avail: NTIS CSCL 06/18

A series of biomedical experiments using chemical lasers was performed in the Aerodynamics and Propulsion Research Laboratory. The purpose of the tests was to establish safety criteria for Air Force-operated laser systems in the 2.6- to 4-micrometer wavelength range. Threshold damage levels were determined for minimal visual corneal damage to the rhesus monkey eye from radiation emanating from HF and DF chemical lasers operating in both continuous and pulsed modes. These are the first corneal damage threshold data obtained at these wavelengths. GRA

N74-12776# Medical Coll. of Wisconsin, Milwaukee. Dept. of Environmental Medicine.
EXPERIMENTAL HUMAN EXPOSURE TO PROPYLENE GLYCOL DINITRATE Final Report
Richard D. Stewart, Jack E. Peterson, Carl L. Hake, Michael J. Hosko, Paul E. Newton, Andre J. Lebrun, and Hugh C. Dodd Sep. 1973 50 p refs
(Contract N00014-71-A-0424-0001)
(AD-766977) Avail: NTIS CSCL 06/20

Human volunteers were exposed to PGDN vapor at concentrations of 0.03, 0.1, 0.2, 0.35, 0.5, and 1.5 ppm. Exposure to concentrations of 0.2 and greater produced disruption of the organization of the visual evoked response (VER) and headache in the majority of subjects. Subjects repeatedly exposed to 0.2 ppm for 8 hours on a daily basis developed a tolerance to headache induction, but the alteration in VER morphology appeared cumulative. Marked impairment in balance became manifest after exposure to 0.5 ppm for 6 1/2 hours while 40 minutes of exposure to 1.5 ppm added eye irritation to the list of symptoms. Author (GRA)

N74-12777# Ocean Systems, Inc., Tarrytown, N.Y.
NEUROPHYSIOLOGICAL INVESTIGATION OF INERT GAS EFFECTS ON THE CENTRAL NERVOUS SYSTEM Final Report, 1 May 1969 - 28 Feb. 1973
Theodore D. Langley 25 Apr. 1973 16 p refs
(Contract N00014-69-C-0405; NR Proj. 101-775)
(AD-766298) Avail: NTIS CSCL 06/19

The program had as its general objective the neurophysiological assessment of the stresses of the gaseous environment encountered in diving. Prominent factors were felt to be those due to ultrahigh pressures, especially following rapid compression, and inert gas narcosis. Major accomplishments were the detailed delineation of the slight narcotic properties of neon at partial pressures as great as 20 atmospheres, both in saturation and following rapid compression, and the exploration of a new technique (somatic evoked responses) for studying such phenomena. GRA

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-12778* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DIGITAL COMPUTING CARDIOTACHOMETER Patent
Hubert E. Smith, John R. Rasquin, and Roy A. Taylor, inventors (to NASA) Issued 20 Nov. 1973 7 p Filed 7 Apr. 1972 supersedes N72-22098 (10 - 13, p 1702)
(NASA-Case-MFS-20284-1; US-Patent-3,773,038; US-Patent-Appl-SN-242027; US-Patent-Class-128-2.06F; US-Patent-Class-128-2.05T; US-Patent-Class-324-78D; US-Patent-Class-324-186) Avail: US Patent Office CSCL 06B

A tachometer is described which instantaneously measures heart rate. During the two intervals between three succeeding heart beats, the electronic system: (1) measures the interval by

counting cycles from a fixed frequency source occurring between the two beats; and (2) computes heat rate during the interval between the next two beats by counting the number of times that the interval count must be counted to zero in order to equal a total count of sixty times (to convert to beats per minute) the frequency of the fixed frequency source.
Official Gazette of the U.S. Patent Office

N74-12779* McDonnell-Douglas Corp., Huntington Beach, Calif.
POTABLE WATER DISPENSER Patent
Herbert R. Cunningham, inventor (to NASA) Issued 11 Dec. 1973 8 p Filed 28 Jun. 1972 Supersedes N72-28097 (10 - 19, p 2517) Sponsored by NASA
(NASA-Case-MFS-21115-1; US-Patent-3,777,942; US-Patent-Appl-SN-266930; US-Patent-Class-222-309; US-Patent-Class-222-340; US-Patent-Class-222-387; US-Patent-Class-222-514) Avail: US Patent Office CSCL 06K

A dispenser particularly suited for use in dispensing potable water into food and beverage reconstitution bags is described. The dispenser is characterized by an expansible chamber, selectively adjustable stop means for varying the maximum dimensions, a rotary valve, and a linear valve coupled in a cooperating relation for delivering potable water to and from the chamber. Official Gazette of the U.S. Patent Office

N74-12780 Arizona State Univ., Tempe.
A MULTIVARIATE STATISTICAL MODEL TO PREDETERMINE PREFERABLE AIRCRAFT ASSIGNMENTS: A FEASIBILITY STUDY Ph.D. Thesis
James Alfred Cline 1973 448 p
Avail: Univ. Microfilm Order No. 73-20434

Research was conducted to investigate the feasibility of constructing a model that could be used by the United States Air Force for the early selection of student pilots for assignment to operational aircraft. Such a model would be of value to the Air Force if the current philosophy of generalized Undergraduate Pilot Training were changed to a specialized philosophy. The results of the study indicate that it is feasible to construct a selection model for application at the completion of the Primary Phase of Undergraduate Pilot Training, to assign pilots to operational aircraft. The validity of the Air Force Officer Qualification Test as a selection device was questioned. AID is compared to regression analysis as a statistical tool; and, the use of Combat Crew Training grades and Officer Effectiveness Report ratings as criteria measures are also discussed.
Dissert. Abstr.

N74-12781*# Michigan Univ., Ann Arbor. Research Center for Group Dynamics.
A PROGRAM TO REDUCE CORONARY HEART DISEASE RISK BY ALTERING JOB STRESSES Final Report, 1 Aug. 1971 - 30 Sep. 1973 - Ph.D. Thesis
Douglas Bruce Campbell Sep. 1973 274 p refs
(Grant NGR-23-005-185)
(NASA-CR-132891) Avail: NTIS HC $13.25

This study reports the design, implementation, and evaluation of a program attempting to reduce job stress by improving person-environment fit with respect to job aspects such as work load, responsibility, and interpersonal relationships. In order to assess the effects of the program, measures of both stress and strain were collected at three points in time--just prior to the program, immediately after the program, and three months after completion of the program. Measures of strain included systolic and diastolic blood pressure, determinations of glucose, cholesterol, and uric acid in the plasma, job satisfaction, and job related self-esteem. The findings were interpreted in light of both program incidents within specific experimental groups and general aspects of the program common to the experimental groups. Additional analyses indicated that both good person-environment fit with respect to participation predicts to good fit with respect to other job aspects over a three month interval and that stress causes strain, rather than the reverse. Author

N74-12782*# Southwest Research Inst., San Antonio, Tex.
PATIENT ASSIST DEVICE PARTS LIST
Melvin A. Schrader and Menan C. Hanz 29 Oct. 1973 15 p
(Contract NAS9-13582; SWRI Proj. 13-3702-001)
(NASA-CR-134158) Avail: NTIS HC $3.00 CSCL 06L

A complete parts list for the patient assist device is presented along with the schematic diagrams. F.O.S.

N74-12783*# Southwest Research Inst., San Antonio, Tex.
OPERATIONS MANUAL FOR THE PATIENT ASSIST DEVICE
Melvin A. Schrader 31 Oct. 1973 74 p Original contains color illustrations
(Contract NAS9-13582)
(NASA-CR-134160) Avail: NTIS HC $5.75 CSCL 06L

Quadraplegic patients and multiple amputee patients are almost totally dependent on nursing personnel for any activities or interests in which they participate. A patient assist device is reported which provides patient control over electrical devices in his environment. The patient operates three switches to acquire control over a desired electrical appliance. The type switches employed are chosen to conform to patient capabilities, even when such capabilities are as limited as eye or head movements. The switch operations are sensed and converted into command signals by the patient assist device to control ten electrical appliances simulataneously and independently. Author

N74-12784*# Webb Associates, Yellow Springs, Ohio.
THE DEVELOPMENT OF AN ELASTIC REVERSE GRADIENT GARMENT TO BE USED AS A COUNTERMEASURE FOR CARDIOVASCULAR DECONDITIONING
James F. Annis and Paul Webb 14 Dec. 1973 69 p refs
(Contract NAS2-7156)
(NASA-CR-114685) Avail: NTIS HC $5.50 CSCL 06B

Using a new Nomex-Lycra elastic fabric and individualized garment engineering techniques, reverse gradient garments (RGG's) were designed, constructed, and tested for effectiveness as a countermeasure against cardiovascular deconditioning. By combining torso-compensated positive pressure breathing with a distally diminishing gradient of counterpressure supplied by the elastic fabric on the limbs, the RGG acts to pool blood in the extremities of recumbent persons much as though they were standing erect in 1 g. It was theorized that through the use of a dynamic pressurization scheme, the RGG would stress the vasculature in a fashion similar to that experienced by the noramlly active man, hence preventing or limiting the development of post-weightlessness orthostatic intolerance and related conditions. Four male, college-age subjects received daily treatments with the RGG during a 15-day bedrest study. Four additional subjects also underwent the bedrest, but received no treatments; they served as controls. The design and construction of the garments are described, and results of the treatment related measurements are given. Author

N74-12785*# Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
OPTIMIZATION OF LIFE SUPPORT SYSTEMS AND THEIR SYSTEMS RELIABILITY Final Report, 1 Jun. 1968 - 31 May 1971
L. T. Fan, C. L. Hwang, and L. E. Erickson 15 Aug. 1971 322 p refs
(Grant NGR-17-001-034)
(NASA-CR-136276) Avail: NTIS HC $18.25 CSCL 06K

The identification, analysis, and optimization of life support systems and subsystems have been investigated. For each system or subsystem that has been considered, the procedure involves the establishment of a set of system equations (or mathematical model) based on theory and experimental evidences; the analysis and simulation of the model; the optimization of the operation, control, and reliability; analysis of sensitivity of the system based on the model; and, if possible, experimental verification of the theoretical and computational results. Research activities include: (1) modeling of air flow in a confined space; (2) review of several different gas-liquid contactors utilizing centrifugal force: (3) review of carbon dioxide reduction contactors in space vehicles and other enclosed structures: (4) application of modern optimal control theory to environmental control of confined spaces; (5) optimal control of class of nonlinear diffusional distributed parameter systems: (6) optimization of system reliability of life support systems and sub-systems: (7) modeling, simulation

and optimal control of the human thermal system: and (8) analysis and optimization of the water-vapor eletrolysis cell. Author

N74-12786# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.

IDENTIFYING AND DETERMINING SKILL DEGRADATIONS OF PRIVATE AND COMMERCIAL PILOTS Final Report, 20 Apr. 1972 - 5 Jul. 1973

Walter M. Hollister, Arthur LaPointe, Charles M. Oman, and John R. Tole Sep. 1973 74 p refs

(Contract DOT-FA72WA-2767)

(FAA-RD-73-91; RE-85) Avail: NTIS HC $5.75

The aeronautical skills of pilots were studied to determine the effects of experience factors. A sample of 55 pilots each flew three flights with an evaluator in a Cessna 150. On the average, subjects received higher scores on skills employed most often. They received the lowest average scores on skills seldom practiced such as stalls and simulated instrument flight. A step-wise regression analysis indicated that an individual's latent skill accounts for 30% of the variance between pilots. Experience factors accounted for 25% of the variance. The most predictive of these experience factors were recency and the logarithm of total time. Recency is the average rate at which a pilot flies. It is the most important experience factor and the one which the pilot can vary most easily. The logarithm of the total time was the second most important experience factor. The logarithmic dependence causes changes of total time to be more important for pilots with low total time. Skill degradation with years since certification was the third most important experience factor. Author

N74-12787# Scientific Translation Service, Santa Barbara, Calif.

CHANGES IN SEVERAL PHYSIOLOGICAL INDICES UNDER THE INFLUENCE OF METAL WORK IN STUDENTS

S. M. Rashman [1973] 5 p refs Transl. into ENGLISH from Gigiena i Sanit. (Moscow), v. 38, no. 2, Feb. 1973 p 105-106 Sponsored by EPA

(HS-100) Avail: NTIS HC $3.00

The dynamics of oxygen saturation of arterial blood as well as changes in the circulation rate and arterial pressure were studied under the influence of mental work. The dynamics of oxygen saturation of arterial blood were determined by the oxyhemography method, using an 0-36 oxyhemograph. Circulation rate was studied by the bloodless oxyhemography method in the lung-ear segment. Arterial pressure was measured by mercury manometer. Results show that the dynamics of oxygen saturation of arterial blood during mental activity can serve as one criterion of its intensity and complexity. As regards changes in circulation rate and arterial pressure, in combination with changes in a number of other indices they can, to a certain degree, indirectly reflect the mobilization readiness of the cardiovascular system in one or another form of mental work. Author

N74-12788# Research Inst. of National Defence, Stockholm (Sweden).

RAPID INFLATION OF A FABRIC BAG BY SOLID FUEL GASES [SNABBUPPBLASNING AV TYGPASE MED KRUTGAS]

David Jacobsson and Sixten Thoren Mar. 1972 18 p ref In SWEDISH

(FOA-1-C-1446-F1) Avail: NTIS HC $3.00

Experiments have been carried out with a solid fuel gas generator for rapid inflation of a fabric bag intended as a protective shield in an automobile. The tests were made with a bag of 60 litre capacity. With the gas generator supplied, the filling time was approximately 75 ms. This time was hardly changed when the amount of fuel varied from 30 to 60 g. At 40 g fuel, a maximum additional pressure of 0.11 to 0.26 atm was reached after about 160 ms. A pressure of 0.5 atm would probably require 60 g. The maximum temperature varies considerably with the position of the measuring point but the representative value would be between 100 and 200 C after 150 ms after which the temperature falls to about 50 C in a few seconds. The maximum noise pressure was, on average, 145 db and the highest 152 db. The bag burst in several cases during the latter series of tests although it remained intact during the earlier series. The reasons for this are not known, but the temperature of the solid fuel gas and its composition can be assumed to be the causes of the problem. Author

N74-12789# Research Inst. of National Defence, Stockholm (Sweden).

METHODS AND TECHNOLOGY FOR STUDIES ON DAZZLING WITH THE HELP OF OPTO-KINETIC-NYSTAGMUS (OKN) [METOD OCH TEKNIK FOER STUDIER AV BLAENDNING MED HJAELP AV OPTO-KINETISK-NYSTAGMUS (OKN)]

Brian Hoegman Jan. 1972 32 p In SWEDISH

(FOA-2-C-2517-E1/E3/E4/H5) Avail: NTIS HC $3.75

Eye performance under different forms of dazzle was studied by an apparatus that records eye opto-kinetic nystagmus by means of electro-oculography. An account is also given of different methods for dealing with recorded data. The apparatus proved to be particularly suitable for the tests, especially because its construction allows for wide variations in illuminating parameters which are significant in judging eye performance with dazzle at different levels. Author

N74-12790# Research Inst. of National Defence, Stockholm (Sweden).

THE FUTURE OF COLOURED ILLUSTRATIONS [FARGBILDEN I FRAMTIDEN]

Gunnar Tonnquist Jan. 1972 18 p In SWEDISH

(FOA-2-C-2521-E1/E3/E4) Avail: NTIS HC $3.00

A popular scientific survey is given over the possible lines of development for the recording and reproduction of color pictures. A description is also given of how color and color pictures can be used not only for decoration and nonessentials, but also to improve presentation of information in scientific, technical, and physical communication and not least as a safety factor. Author

N74-12791# Research Inst. of National Defence, Stockholm (Sweden).

THE DEPENDENCE OF THE OPTICAL BLINK REFLEX ON LIGHT ENERGY [OPTISK BLINKREFLEX BEROENDE AV LJUSENERGI]

Brian Hoegman, Bjorn Tengroth, and Goran Ornberg Jan. 1972 42 p refs In SWEDISH

(FOA-2-C-2519-E1/E3/E4/H5) Avail: NTIS HC $4.25

Light energy influences on the optical blink reflex are described from an experiment where the triggering light duration and luminance were varied. For the experiment two different age categories of test personnel were used. The results show that no major differences concerning reaction time could be established at the levels of energy used in the experiment. On the other hand, reaction is affected by movement of the eye lids and frequency of covering the pupil etc. Moreover, differences in reaction dependence on the age of the test personnel can be established. Author

N74-12792# Research Inst. of National Defence, Stockholm (Sweden).

ALTERNATIVE METHODS FOR RECORDING BLINK REFLEX [ALTERNATIVA METODER FOR REGISTRERING AV BLINKREFLEX]

Brian Hogman, Bjorn Tengroth, and Goran Ornberg Jan. 1972 39 p refs In SWEDISH

(FOA-2-C-2518-E1/E3/E4/H5) Avail: NTIS HC $4.00

The optical blink reflex is studied with two different recording methods, each with two evaluation alternatives. The blink reflex has been recorded partly with high speed photography and partly by means of electro-oculography. The reflexes were recorded simultaneously. A comparison is given of the different evaluation alternatives their accuracy and the work involved. Author

N74-12793# Research Inst. of National Defence, Stockholm (Sweden).

COMPUTER PROGRAM FOR MEASURING BLINK REFLEX. PART 1: MOVEMENT OF THE EYELIDS [DATAPROGRAM FOR BERAKNING AV BLINKREFLEX. DEL 1: OGONLOCKETS RORELSE]

Hjordis Celander Oct. 1971 39 p refs In SWEDISH

(FOA-2-C-2495-E1/A4-Pt-1) Avail: NTIS HC $4.00

A film has been taken of an eye blinking when caught in a flash of light. On the photographs so obtained, measurements

have been made of the eye lids position by means of a flim evaluation apparatus which delivers the results in the form of a punched card, one for each photograph. A description of a computer program is given which registers these data cards and from them calculates and plots curves of the eye lids' displacement as a function of time. A number of reference points measured on the photographs have also been examined from which information has been obtained concerning the accuracy of measurement. Author

N74-12794# Research Inst. of National Defence, Sundbyberg (Sweden).

RAPID INFLATION OF A FABRIC BAG BY AN INERT GAS [SNABBUPPBLASNING AV TYGPASE MED INERTGAS]

Sixten Thoren Mar. 1972 28 p refs In SWEDISH
(FOA-1-C-1445-F1) Avail: NTIS HC $3.50

The phenomena of time, pressure, temperature and noise that arise when inflating a 60 liter fabric bag with inert gas are investigated. Representative data from the investigation have been collected and are presented in the form of pictures, tables and diagrams. Author

N74-12795# Research Inst. of National Defence, Stockholm (Sweden).

A COMPARISON BETWEEN THE THRESHOLDS OF DETECTION WITH A STATIONARY AND MOVING OBJECT AGAINST BACKGROUNDS OF DIFFERENT COMPLEXITY [EN JAMFORELSE MELLAN UPPTACKTS-TROSKLARNA VID STILLASTAENDE OCH RORLIGA MAL MOT BAKGRUNDER AV OLIKA KOMPLEXITET]

Agneta Jonsson Feb. 1972 30 p refs In SWEDISH
(FOA-2-A-2551-H5) Avail: NTIS HC $3.50

The object was composed of black squares and presented partly stationary and partly at speeds of 2.9 arc min/s and 14.4 arc min/s against three different backgrounds. For experiment 1 the background was a homogeneous white, in experiment 2 it consisted of randomly situated black spots against a white ground, and in experiment 3 it was the same as 2 but with a larger number of spots. The threshold levels were the same for stationary and moving objects in the experiment without background structure. In experiment 2 (slight disturbing structure) and experiment 3 (considerable disturbing structure) the threshold levels were lower for moving than for stationary objects and this difference was greatest in experiment 3. The speed of 14.4 arc min/s gave lower threshold levels than the speed of 2.9 arc min/s. This is thought to be due to the contrast factor being most significant with a white background whilst the movement factor is of little or no significance for the objects threshold level. Author

N74-12796# Research Inst. of National Defence, Stockholm (Sweden).

AN EXPERIMENTAL STUDY OF THE SIGNIFICANCE OF SHARPNESS OF OUTLINE IN VISUAL DETECTION [EN EXPERIMENTELL STUDIE AV KANTSKARPANS BETYDELSE VID VISUELL DETEKTION]

Lars Linden Dec. 1971 17 p refs In SWEDISH
(FOA-2-C-2507-E1) Avail: NTIS HC $3.00

The importance of sharp outlines in detecting visual signals from strong additive noise is reported. Experiments indicate that for certain test observers the probability of detecting the signal was strongly dependent on sharp outlines whilst for others it was almost independent of them. The experiments are discussed starting from two models of the visual process. Author

N74-12797# Research Inst. of National Defence, Stockholm (Sweden).

A METHOD FOR A SIZE, POSITION AND ROTATION INVARIANT DESCRIPTION OF A SILHOUETTE [EN METOD FOER STORLEKS-, LAEGES- OCH ROTATIONSINVARIANT BESKRIVNING AV EN SILHUETT]

Bjoern Kruse Feb. 1973 22 p ref In SWEDISH
(FOA-3-C-3701-E5) Avail: NTIS HC $3.25

Different ways of describing objects entering into a picture are studied in the field of picture treatment. Descriptions of a way of characterizing the object's silhouette by size, position, orientation and shape are given. The indication of shape depends on size, position and orientation interpreted for every silhouette. Author

N74-12798*# Battelle Memorial Inst., Richland, Wash.

MEASUREMENT OF RADIATION EXPOSURE OF ASTRONAUTS BY RADIOCHEMICAL TECHNIQUES Quarterly Research Report, 2 Apr. - 30 Jun. 1973

R. L. Brodzinski 15 Jul. 1973 22 p refs Sponsored in part by NASA
(Contract AT(45-1)-1830)
(NASA-CR-136217; BNWL-1183-15) Avail: NTIS HC $3.25
CSCL 06R

A cosmic radiation dose to the Apollo 17 crew of <1.3 R was calculated from the specific activities of Na-24 in their postflight urine specimens. The specific activities of K-42, Cr-51, Co60, and Sb-124, introduced by injection into the astronauts, are extremely high in these specimens. The Fe-59 and Cs-137 levels are also reported and appear to be normal. The concentrations of Na, K, Rb, Cs, Ca, Sr, Ba, Cr, Fe, Co, Ag, Au, Zn, Cd, Hg, Sn, As, Sb, Se, Br, Sc, La, Sm, Eu, Tb, Hf, Ta, and Th were measured in urine specimens from the Apollo 17 astronauts by neutron activation analysis. Strontium, barium, gold, cadmium, lanthanum, samarium, europium, terbium, thorium, and tin are reported for the first time. The concentrations or excretion rates of bromine and the alkali metals exhibit singificantly reduced postflight levels and are generally lower than values observed for previous missions. Chromium concentrations reflect radiochromium injections. Author (NSA)

N74-12799# Freiburg Univ. (West Germany). Inst. fuer Physik.

FREQUENCY AND SEQUENTIAL ANALYSIS OF TIME SERIES [FREQUENZ- UND SEQUENZANALYSE VON ZEITREIHEN]

G. Landwehr Nov. 1972 39 p refs In GERMAN
(Rept-C-19) Avail: NTIS HC $4.00

The possibility of the sequential analysis of time series using a digital computer, is investigated, and compared with frequency analysis. The investigations were based on the application of discrete Fourier and Walsh transformations. A technique is described to obtain comparable Fourier and Walsh spectrograms. The representation of the sine functions with the aid of Walsh functions produces the explanation why Fourier and Walsh spectrograms are similar. Fourier and Walsh spectrograms were prepared and discussed for electroencephalogram signals, the German vowel a, and an 'artificial' time series (a machine program for a digital computer). ESRO

N74-12800# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.

CONSIDERATIONS OF THE PILOT IN FLIGHT MECHANICAL PROJECT STUDIES [ZUR BERUECKSICHTIGUNG DES PILOTEN BEI FLUGMECHANISCHEN PROJEKTSTUDIEN]

Manfred Zindel 15 Oct. 1972 67 p In GERMAN
(IFD-3/72) Avail: NTIS HC $5.50

Existing mathematical models for describing pilot behavior are reviewed. Experiments aimed at establishing a new model were carried out, based on the reaction-time-depends-on-input-signal assumption. Two types of input signals, with corner frequencies of 0.7 Hz resp. 0.1 Hz were used. The reaction time of persons tested, who were asked to recognize the input signal variation and to compensate these with the aid of the buttons, was measured. The results showed that the fluctuation value of the reaction time is independent of the local properties of the input signals. Average value and standard deviation of this fluctuation value clearly depend on the flat rate properties of the input signal. ESRO

N74-12801# Air Force Human Resources Lab., Brooks AFB, Tex.

VARIABLES INFLUENCING THE PERCEPTION OF FLICKER IN WIDE ANGLE CRT DISPLAYS Final Report

William L. Welde and Bertram W. Cream Dec. 1972 81 p refs
(AF Proj. 1710)
(AD-766443; AFHRL-TR-72-4) Avail: NTIS CSCL 05/10

An experiment was conducted to determine the influence of several variables on the perception of the psychophysical

phenomenon of flicker in wide angle CRT displays. Three independent variables were 3, 6, and 9 FL illumination levels, of which there were four images, three static and one dynamic; 26 fixation points were positioned around a display from 0 to 120 deg in the horizontal axis and 60 deg down to 90 deg up in the vertical axis. Recorded measures in the factorial experiment consisted of time to the first observation of flicker, percentage of the total number of trials that flicker was observed, and the severity of flicker regarding its interference with a visual task. Analysis of variance tests were applied to the experimental data. (Modified author abstract) GRA

N74-12802# URS Systems Corp., Falls Church, Va. Matrix Research Div.

ASSISTANCE IN IMPROVING THE ELECTRONIC TECHNICIAN TRAINING AT THE US COAST GUARD TRAINING CENTER, GOVERNOR'S ISLAND, NEW YORK Final Report

E. L. Shriver and F. L. Hart Jan. 1973 107 p refs

(Contract DOT-CG-13542-A)

(AD-766556) Avail: NTIS CSCL 05/9

A training module was developed for each of the following equipments: Radar, radio receiver, LORAN receiver, and transmitting set. The student is guided through an analytic process by answering a series of carefully structured questions designed to guide him through a complete analysis of the equipment for both understanding and troubleshooting. Training emphasis is not on theory but on the practical applied aspects of maintenance through the use of technical manuals and hands for the repair of equipment failures. Performance tests were developed for each module. GRA

N74-12803# Indiana Univ., Bloomington. Div. of Optometry.

COMPARATIVE PERFORMANCE OF AVIATION FILTERS ON THE HUMAN CONTRAST SENSITIVITY FUNCTION Final Report, Mar. 1971 - Jun. 1973

Ronald W. Everson and John R. Levene Jul. 1973 74 p refs

(Contract F33615-71-C-1730; AF Proj. 7183)

(AD-767212; AMRL-TR-73-13) Avail: NTIS CSCL 05/5

Grating targets of different spatial frequency and with square and sine wave luminance distributions were presented to male subjects who wore ophthalmic filters that are frequently used by aviators, namely, neutral gray, yellow, and rose-colored. Threshold light modulation that permitted detection of the grating pattern was determined. Average luminance levels from bright to dim were used. Although contrast sensitivity was found to vary with luminance level, it has not been possible to demonstrate the clear-cut superiority of one colored sunglass filter over another in this experiment. The differences that are seen are related to the luminous transmittances of the filter and not to their intrinsic colorations. Author (GRA)

N74-12804# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

EXCURSIONS OF HEAD, HELMET AND HELMET-ATTACHED RETICLE UNDER PLUS G FORCES Final Report

Kenneth W. Kennedy and K. H. Eberhard Kroemer May 1973 90 p refs

(AF Proj. 7184)

(AD-767201; AMRL-TR-72-127) Avail: NTIS CSCL 05/5

Open-loop centrifuge runs reaching -6g(z) were performed with 13 subjects wearing two different types of helmets: the foam-padded standard HGU-2A/P, and the Gentex 129-2 with adjustable web suspension. Rigidly attached to the helmet was a lightweight reticle with its crosshair about 1-1/2 inches in front to the left eye. Masses were attached at top and sides of the helmets. The total maximal load was limited to 40 ounces, and the largest lateral off-balance to 15 ounces. During the centrifuge runs, each subject attempted to maintain his gaze at a target directly in front of him. Hence, no voluntary motion of the head should have occurred. Position of head, helmet, and reticle were recorded photographically at each g-level. From the photographs, data on actual excursions of the head, helmet, and reticle were extracted and subjected to a computer-aided analysis. Involuntary angular head movements, as well as rotational displacements of the helmet on the head, are discussed in this paper in terms of pitch, roll and yaw. Also described are linear changes in the vertical height of the subjects' eyes. Reticle displacements are discussed as they occurred in a frontal y-z plane. Author (GRA)

N74-12805# New Mexico State Univ., University Park. Dept. of Psychology.

COLOR RESEARCH FOR VISUAL DISPLAYS Final Report, 1 Feb. 1972 - 31 Jul. 1973

Richard E. Christ and Warren H. Teichner Jul. 1973 118 p refs

(Contract N00014-70-A-0147-0003; NR Proj. 213-102)

(AD-767066; NMSU-JANAIR-FR-73-1; JANAIR-730703) Avail: NTIS CSCL 05/5

The experimental literature on the effects of color on visual search and identification performance was reviewed. Forty-three studies published between 1952 and 1973 were located that gave results which could be used to determine the effectiveness of color codes relative to various types of achromatic codes. Quantitative analyses of these results indicated that color may be a very effective performance factor under some conditions, but that it can be detrimental under others. Tentative conclusions about the nature of these conditions were derived from the results and these conclusions were supported by an exploratory experiment. A guide for design decisions and an indication of knowledge gaps are also provided. Author (GRA)

N74-12806# Naval Aerospace Medical Research Lab., Pensacola, Fla.

ISOLATION RECURRING STUDENT PILOT ERRORS DURING PRIMARY FLIGHT TRAINING. 1: SPIN MANEUVER

Richard H. Shannon, Wayne L. Waag, and Gerald M. Long 15 Aug. 1973 44 p

(MF51524002)

(AD-767377; NAMRL-1189) Avail: NTIS CSCL 05/9

The investigation attempted to: Develop a conceptual model for investigating student naval aviator (SNA) performance in primary flight training; isolate, with the use of the model, those behaviors within the spin maneuver which are judged to be recurring student pilot errors; assess the criticality of these errors as they relate to the grades a student receives; and provide behavioral definitions of the global skills, basic airwork, headwork, and procedures. A procedural type of task analysis was performed on the spin maneuver. The necessary responses to each display and control both within and outside the aircraft were specified on a sequential continuum. Within each of these sequential components, a highly elemental approach (i.e., emphasis on the simultaneous individual responses to each display and control at each point in time) was taken so that it was possible to isolate the required simultaneous response configuration at any given point throughout the maneuver. An objectively structured questionnaire was developed using these individual task elements as the basic item pool, and administered to a sample of 97 flight instructors in primary flight training. The results of this investigation indicated that the recurring student errors within the spin maneuver could be isolated using this type of approach. Further, the definitions for the terms basic airwork, headwork and procedures and what constitutes a critical error were set forth. Author (GRA)

N74-12807# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.

LLNO MEDEVAC HUMAN FACTORS ANALYSIS Final Report

James R. Peterson and James W. Wingert 1 Feb. 1973 122 p refs

(Contract N00014-69-C-0460; NR Proj. 213-072)

(AD-767070; HONEYWELL-12609-FR1; JANAIR-730704) Avail: NTIS CSCL 15/7

The report presents the results of a study to support the preliminary System Synthesis task of the Low Level Night Operations (LLNO) program, as it applies to LLNO Search and Rescue and LLNO Medical Evacuation Missions. The study consisted of analytic studies of human factors problems. Recommendations are made for displays and controls and for a layout in the helicopter cockpit. Author (GRA)

N74-12808# Naval Air Development Center, Warminster, Pa. Crew Systems Dept.

PROBLEMS OF HIGH ALTITUDE AND HIGH SPEED EJECTIONS Final Report
Thomas J. Zenobi 30 Jul. 1973 46 p refs
(AD-767321; NADC-73001-40) Avail: NTIS CSCL 06G

High speed ejections and high altitude ejections pose severe problems for the crewman ejection seat system. Ejection seat systems need to be upgraded to satisfy these escape conditions for new generation high performance aircraft. Windblast, deceleration, temperature extremes, stabilization, oxygen deficiency and pressure change are problems to be considered. Some of these problems are common with present ejection seats also, but they become more severe for conditions of higher speeds and higher altitudes. Development is being conducted in some of the problem areas; however, in other areas development must be undertaken to achieve the results desired by this project.
Author (GRA)

N74-12809# Research Inst. of National Defence, Sundbyberg (Sweden).
WAYS OF REDUCING THE RISKS OF ACCIDENTS [VAEGAR ATT MINSKA OLYCKSRISKER]
Stig Ek Mar. 1972 28 p In SWEDISH
(FOA-1-A-1550-D1) Avail: NTIS HC $3.50

The possibilities of reducing accident risks by research, training and different feed back systems are discussed. The limits of overcoming accidents by pure statistics are analyzed. Combinations of protection systems are discussed. A means of improving information on how accidents happen is necessary for rational procedures. Technology must be adopted to the human as much as possible and to his natural reactions to create a human environment. A long term objective is probably to work out an intimate integration of man and technology with the help of measuring techniques and advanced treatment of data. Particularly dangerous processes will be remote controlled and automated.
Author

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-12810 Ohio State Univ., Columbus.
A VISUAL STUDY OF THE DYNAMICS OF POLYMER EXTRUSION Ph.D. Thesis
Mazen Yacoub Anastas 1973 154 p
Avail: Univ. Microfilms Order No. 73-18859

A visual study of the dynamics of plasticating screw extrusion was undertaken by using a 1-inch diameter extruder with a transparent barrel. The extrudate consisted of frozen pellets of a 40 percent solution of polystyrene in diethylphthalate plasticizer. Blue and red colored pellets of the same material were added in order ot mark the flow of material in the screw channel. The flow was recorded on color movie film taken at both 15 and 90 frames/sec. Movies of the unsteady state, as well as the steady state, flow were obtained. Unsteady conditions in the flow were induced by introducing step changes in screw speed, which were in the range of 60 to 75 rpm. Analysis of the steady state movies revealed that the steady melting mechanism, as described by past workers, is valid. Dissert. Abstr.

N74-12811 Cornell Univ., New York.
EXPERIMENTAL AND THEORETICAL STUDIES OF THE VIBRATIONAL ENERGY DISTRIBUTION IN CARBON MONOXIDE PRODUCED IN THE REACTION OF OXYGEN WITH ACETYLENE Ph.D. Thesis
Yung Sheng Liu 1973 142 p
Avail: Univ. Microfilms Order No. 73-18355

TR chemiluminescence from vibrationally excited carbon monoxide produced in the oxygen-acetylene reaction has been studied for potential use as a new chemical laser system. The vibrational population distribution for CO has been determined from the first overtone emission spectrum. The measurements demonstrate a non-equilibrium vibrational population distribution characteristic of an anharmonic molecule, and include the first observation of a totally inverted vibrational population in CO chemically excited in the oxygen-acetylene reaction and following preferential deactivation in the presence of additional ground state CO. The V-V energy transfer probabilities in CO-CO collisions at room temperature have been determined from the IR chemiluminescence data by using a fast flow approximation.
Dissert. Abstr.

N74-12812* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
POLYIMIDE FOAM FOR THE THERMAL INSULATION AND FIRE PROTECTION Patent
Robert W. Rosser, inventor (to NASA) Issued 13 Nov. 1973 4 p Filed 12 Nov. 1971 Supersedes N72-21102 (10 - 12, p 1566)
(NASA-Case-ARC-10464-1; US-Patent-3,772,216; US-Patent-Appl-SN-198472; US-Patent-Class-260-2.5AM) Avail: US Patent Office CSCL 07D

The preparation of chemically resistant and flame retardant foams from polyfunctional aromatic carboxylic acid derivatives and organic polyisocyanates is outlined. It was found that polyimide foams of reproducible density above 1 lb./ft. and below 6 lbs./cu ft. can be obtained by employing in the reaction of least 2% by weight of siloxane-glycol copolymer as a surfactant which acts as a specific density control agent. Polyimide foams into which reinforcing fibers such as silicon dioxide and carbon fibers may be incorporated were also produced.
Official Gazette of the U.S. Patent Office

N74-12813* General Dynamics/Convair, San Diego, Calif.
CATALYST CARTRIDGE FOR CARBON DIOXIDE REDUCTION UNIT Patent
Roy F. Holmes, inventor (to NASA) Issued 13 Nov. 1973 5 p Filed 21 Oct. 1971 Supersedes N72-21099 (10 - 12, p 1566) Sponsored by NASA
(NASA-Case-LAR-10551-1; US-Patent-3,771,959; US-Patent-Appl-SN-191301; US-Patent-Class-23-288J; US-Patent-Class-23-288F; US-Patent-Class-23-252R; US-Patent-Class-23-281; US-Patent-Class-423-231; US-Patent-Class-128-191R; US-Patent-Class-55-510; US-Patent-Class-55-518) Avail: US Patent Office CSCL 07D

A catalyst cartridge, for use in a carbon dioxide reducing apparatus in a life support system for space vehicles, is described. The catalyst cartridge includes an inner perforated metal wall, an outer perforated wall space outwardly from the inner wall, a base plate closing one end of the cartridge, and a cover plate closing the other end of the cartridge. The cover plate has a central aperture through which a supply line with a heater feeds a gaseous reaction mixture comprising hydrogen and carbon dioxide at a temperature from about 1000 to about 1400 F. The outer surfaces of the internal wall and the inner surfaces of the outer wall are lined with a ceramic fiber batting material of sufficient thickness to prevent carbon formed in the reaction from passing through it. The portion of the surfaces of the base and cover plates defined within the inner and outer walls are also lined with ceramic batting. The heated reaction mixture passes outwardly through the inner perforated wall and ceramic batting and over the catalyst. The solid carbon product formes is retained within the enclosure containing the catalyst. The solid carbon product formed is retained within the enclosure containing the catalyst. The water vapor and unreacted carbon dioxide and any intermediate products pass through the perforations of the outer wall.
Official Gazette of the U.S. Patent Office

N74-12814* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLEXIBLE FIRE RETARDANT POLYISOCYANATE MODIFIED NEOPRENE FOAM Patent
John A. Parker and Salvatore R. Riccitiello, inventors (to NASA) Issued 13 Nov. 1973 3 p Filed 21 Apr. 1971
(NASA-Case-ARC-10180-1; US-Patent-3,772,220; US-Patent-Appl-SN-136253; US-Patent-Class-260-2.5L) Avail: US Patent Office CSCL 07D

Lightweight, fire resistant foams have been developed through the modification of conventional neoprene-isocyanate foams by the addition of an alkyl halide polymer. Extensive tests have shown that the modified/neoprene-isocyanate foams are much superior in heat protection properties than the foams heretofore

employed both for ballistic and ablative purposes.
Official Gazette of the U.S. Patent Office

N74-12815 Cornell Univ., New York.
COMPRESSIONAL COOLING AND ULTRALOW TEMPERATURE PROPERTIES OF He3 Ph.D. Thesis
Douglas Dean Osheroff 1973 156 p
Avail: Univ. Microfilms Order No. 73-20171

The technique of compressional cooling of He-3 is investigated using a versatile device. Several characteristics of the cooling process are discussed. Thermometry using NMR techniques on copper and platinum metals is described and the two thermometers are compared with each other and with the He-3 melting curve to temperatures as low as 2.7 mK. Finally, the discovery of new phases of liquid He-3 at temperatures below 3mK is described in detail, including the properties of the new phases as observed through the compression process and NMR techniques.
Dissert. Abstr.

N74-12816 British Library Lending Div., Boston Spa (England).
KINETICS OF THE SOLUTION OF TITANIUM NITRIDE IN THE IRON-CARBON-OXYGEN SYSTEM
Yu Gurevich, G., V. I. Tomilov, and N. R. Frage [1973] 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 3, 1973 p 47-48 In ENGLISH and RUSSIAN (BLL-M-21710-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The kinetics of the solution of titanium nitride in FeO and Fe-C-O systems have been studied. Titanium nitride is practically insoluble in liquid deoxidized iron and alloys. At an oxygen concentration of over 0.0030% in iron, Tin begins to dissolve in liquid iron, the rate of solution increasing with increasing oxygen concentration. Solution is accompanied by oxidation of titanium nitride to the oxide Ti203 and evolution of atomic nitrogen, which dissolves in the iron. Analytical relationships have been found between the corrected rate of nitride solution in FeO and Fe-C-O alloys and their oxygen and carbon concentrations.
Author

N74-12817*# Michigan Univ., Ann Arbor. College of Engineering.
A LISTING OF WAVENUMBERS AND INTENSITIES OF CARBON DIOXIDE ABSORPTION LINES BETWEEN 12 AND 20 MICROMETERS Technical Report
S. Roland Drayson May 1973 99 p refs
(Contract NSR-23-005-376; ORA Proj. 036350)
(NASA-CR-132884; Rept-036350-4-T) Avail: NTIS HC $7.00 CSCL 07D

A listing is given of the wavenumber, intensities at 300, 275, 250, 225, 200 and 175 k and energy of the lower state of CO2 absorption lines between 12 and 20 microns. They are ordered by wave-number and include 19 bands of C-12(O-16)2, 4 bands of C-13(O-16)2, 2 bands of C-12-O-16-O-18 and 1 band of C-12-O-16-O-17. The vibrational and rotational constants and the band intensities used to calculate the line parameters are tabulated.
Author

N74-12818# Scientific Translation Service, Santa Barbara, Calif.
OBSERVATIONS ON THE BLANK VALUES OF REAGENTS IN THE DETERMINATION OF SMALL QUANTITIES OF LEAD IN ATMOSPHERIC AIR
H. Kettner [1973] 6 p ref Transl. into ENGLISH from Wasser-, Boden- und Lufthygiene, v. 29, Oct. 1969 p 51-54 Sponsored by EPA
(TR-663-73; APTIC-15618) Avail: NTIS HC $3.0

The blank or basal values resulting from the lead contents of reagents used in the analysis, and that blank value due to the method of sampling k are analyzed. Extinction values in sequentially performed reagent blank determination using lead free apparatus, and with constant instrumentation are discussed. It is concluded that the reagent blank value, to a large extent, results from the use of ordinary glass apparatus containing lead.
F.O.S.

N74-12819*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HYDROCHLORIC ACID AEROSOL FORMATION BY THE INTERACTION OF HYDROGEN CHLORIDE WITH HUMID AIR
Robert A. Rhein 15 Nov. 1973 15 p refs
(Contract NAS7-100)
(NASA-CR-136215; JPL-TM-33-658) Avail: NTIS HC $3.00 CSCL 07B

The conditions in which hydrochloric acid aerosol is predicted by the interaction of hydrogen chloride gas with the water vapor in humid air are analyzed. The liquid gas phase equilibrium for the HCL-H2O system is expressed in terms of relative humidity and hydrogen chloride concentration as parts per million, units commonly used in pollution studies. Presented are the concentration (wt %) of HC1 in the aerosol and the concentration of aerosol (ppm) predicted.
Author

N74-12820*# Ultrasystems, Inc., Newport Beach, Calif.
FLAME RETARDANT POLYPHOSPHAZENES Progress Report, Jul. 1972 - Aug. 1973
K. L. Paciorek, D. W. Karle, and R. H. Kratzer Dec. 1973 106 p refs
(Contract NAS3-16768)
(NASA-CR-134463; SN-281-F) Avail: NTIS HC $7.50 CSCL 07D

Six polyphosphazene compositions were prepared by reaction of three bis-tertiary phosphines with two phenyl-s-triazine derived diazides. All six polyphosphazenes produced were completely characterized, four of them were furthermore subjected to isothermal gravimetric analysis, smoke density measurements, flammability and oxidative thermal degradation testing. The results of the characterization studies indicate that only low molecular weight oligomers, possibly of a cyclic structure, were obtained in the polymerization reactions. Despite this, however, two of the materials showed no weight loss after 96 hr at 200 C, one did not autoignite at 500 C in air, and all four self extinguished when exposed to a flame as soon as contact between flame and resin was lost. The only toxic decomposition products to be concerned about were found to be hydrogen cyanide and benzene. Under the conditions employed it was proven, however, that the quantities of toxic products are greatly reduced if no ignition takes place, e.g., if thermal decomposition proceeds at a sufficiently low rate.
Author

N74-12821*# Aeronautical Research Associates of Princeton, Inc., N.J.
A PRELIMINARY SENSITIVITY ANALYSIS OF THE COUPLED DIFFUSION AND CHEMISTRY MODEL
Glenn R. Hilst and Ross M. Contiliano Oct. 1973 68 p refs
(Contract NAS1-12475)
(NASA-CR-132369; ARAP-203) Avail: NTIS HC $5.50 CSCL 07D

The sensitivity of the coupled chemistry/diffusion model's outputs to a wide range of variation of the model's independent variables has been investigated. It is shown that the efficiency with which the now catalytic cycle destroys ambient O3 is extremely sensitive to the amount of NO emitted and to the relative rates of turbulent diffusion and chemical reactions. For representative conditions in the stratosphere, a tenfold variation of either the turbulence intensity or the reaction rate constant or the source strength can vary the efficiency from 1% to 50%. If the duration of Phase 3 is a significant fraction of the total residence time of the plume, then these efficiency variations can alter O3 depletion rates by more than a factor of two. These results, therefore, point toward those variables which must be accurately defined or measured if one is to adequately predict the effect of SST operations on the ambient inventory of O3 in the lower stratosphere.
Author

N74-12822# Research Inst. of National Defence, Stockholm (Sweden).
DEVELOPMENT OF AN ELECTROCHEMICAL METHOD FOR THE EVALUATION OF FUEL TANK CORROSION INHIBITORS Progress Report
Lars Schoen and Per Atterby 1972 8 p refs Presented at 6th Scand. Corrosion Congr.
(FOA-1-B-1208-G3/G1) Avail: NTIS HC $3.00

Two forms of corrosion occur in fuel tanks; general corrosion and pitting. Of these two the latter is the most

destructive. In many cases inhibitors are used to combat the corrosion, but little is known about their properties when pitting corrosion of carbon steel is concerned. Existing immersion tests and electrochemical methods are not considered sufficient for the purpose. For this reason an electrochemical crevice corrosion cell has been developed to study the effect of corrosion inhibitors on existing pits. The propagation of the pitting is measured with the corrosion current. Correlation investigations with processes in 6 fuel tanks are being made. Author

N74-12823# Research Inst. of National Defence, Stockholm (Sweden).

LEAKING CURVES FOR ACTIVATED CARBONS WITH PHYSICALLY SORBED GASES AT LOW LEAKING CONCENTRATIONS

Gunilla Bergstroem, Erik Ekedahl, and Lars Gunnar Sillen Oct. 1971 11 p refs

(FOA-1-B-1190-C5) Avail: NTIS HC $3.00

A study was made of how gaseous CW agents of the physically sorbed type break through protection masks. The breakthrough was studied by measuring leaking curves for the model gases trimethylamine, triethylamine, and pyridine. The sorbents used were one type of carbon in pellet form and two grain-size fractions of a coal carbon. According to one theory, sorption takes place only by condensation of gas in the pores of the sorbent, all of which are exactly alike. If this were true, a relatively high concentration of gas would leak through the filter right from the beginning. No evidence of such leaking was found. According to other theories, sorption is a bimolecular reaction between sorbate and sorbent, making possible the calculation of leaking curves for carbon filters. In general, a good agreement was obtained between experimentally found leaking curves and curves calculated according to these theories. It was shown that, given a leaking curve and the sorption isotherm for a certain gas and a certain type of sorbent, the time of resistance for this gas can be calculated for any filter dimension, gas concentration, and rate of flow. Author

N74-12824# Research Inst. of National Defence, Sundbyberg (Sweden).

COMBUSTION OF THE GASES METHANE, LP GAS AND AMMONIA IN A MIXING REACTOR [FOERBRAENNING AV GASERNA METAN, GASOL OCH AMMONIAK I EN FOERBLANDAD REAKTOR]

Henry Kanebaeck and Ivar Lill Mar. 1972 31 p In SWEDISH

(FOA-1-C-1442-H3) Avail: NTIS HC $3.75

The burning of sulfurous compounds in a test reactor for removing contaminants in the air is considered. The reactor is a flow tube with a stage for mixing, and combustion is obtained without catalysts at as high a temperature as possible. Previous good results using sulfurous compounds have been verified with LP gas and ammonia whilst as expected, methane is needed for difficult reactions. From the point of view of preserving the environment it is also interesting to see whether, in addition to questions of the economics of heating, selective combustion in mixtures of ammonia and sulfurous compounds, e.g. H2S and RSH, are acceptable. Author.

N74-12825# Research Inst. of National Defence, Sundbyberg (Sweden).

INHIBITORS AGAINST TANK CORROSION [INHIBITORER MOT CISTERNKORROSION]

Per Atterby Dec. 1971 18 p In SWEDISH

(FOA-1-A-1545-G3/G1) Avail: NTIS HC $3.00

The term inhibitor is defined and the effective mechanisms of different types of inhibitors are described. Ordinary corrosion in oil tanks is described as a non critical form of corrosion, in contrast to cavity erosion, which is destructive and can lead to perforation. The conditions in tanks are recapitulated and the need for a good corrosion inhibitor is described. Known methods for evaluation of inhibitors against tank corrosion are considered. Author

N74-12826# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Labs.

ELECTROCHEMICAL PROPERTIES AND OXIDATION OF SOME ZIRCONIUM ALLOYS IN MOLTEN SALT AT 300 C TO 500 C

W. Hubner and B. Cox May 1973 53 p refs

(AECL-4431) Avail: AEC Depository Libraries HC $4.75; Atomic Energy of Can., Ltd., Chalk River $1.50

The oxidation rate and current-voltage characteristics of a number of zirconium alloys were determined in a molten-salt environment at 300 to 500 C. The electrochemical measurements are found to be of only limited use for determining the mechanism of the different partial processes contributing to the overall oxidation process, mainly because of hysteresis effects and insufficiently accurate current measurements around the oxidation potential. However, such measurements do seem to offer possibilities for qualitative evaluation of the separate contributions from the partial processes involved in the oxidation reaction. For the ionic transport process the current-voltage relationship and its temperature dependence point to a Tafel-type diffusion process, having an apparent activation energy closely similar to those given in the literature for linear diffusion of oxygen in zirconia. Author (NSA)

N74-12827# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.

OPTICAL AND ELECTROCHEMICAL STUDIES OF UNDERPOTENTIAL DEPOSITION OF LEAD ON GOLD EVAPORATED AND SINGLE CRYSTAL ELECTRODES

Radoslav Adzic, Ernest Yeager, and B. D. Cahan 15 Jul. 1973 51 p refs

(Contract N00014-67-A-0404-0006; NR Proj. 359-451)

(AD-766821; TR-34) Avail: NTIS CSCL 07/4

Linear sweep voltammetry and reflectance spectroscopy have been used to examine the under potential deposition of lead on gold in Pb(2-) containing HC104 solutions. The voltammetry curves and reflectance change data provide evidence that the lead is first deposited as ions although their effective ionic charge is probably reduced substantially from -2 through their strong interaction with the band structure of the gold substrate. At more cathodic potentials, still well below the reversible potential of bulk lead, a sharp transition is observed over a 5 to 10 mV range. This transition appears to involve a two dimensional phase transition leading to a metallic-like lead layer. Adsorption isotherms have been evaluated from the reflectance changes. AC electromodulation techniques and complex plane analysis have been used to examine the kinetics of the lead adsorption-desorption and to evaluate the apparent exchange current density for the process. (Modified author abstract) GRA

N74-12828# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.

SCANNING ELLIPSOMETRY AS A TOOL FOR THE CHARACTERIZATION OF ABSORBING SURFACE FILMS

Jean Horkans, B. D. Cahan, and Ernest Yeager 1 Jun. 1973 82 p refs

(Contract N00014-67-A-0404-0006; NR Proj. 359-451)

(AD-766820; TR-33) Avail: NTIS CSCL 07/4

The general theory of reflection and of ellipsometry is reviewed. The new technique of scanning ellipsometry, which allows a conventional ellipsometer to be used to follow film growth dynamically, is described. A program is given which allows the characterization of an absorbing surface film (i.e., determination of its complex refractive index and thickness) from measured changes in the ellipsometric parameters Delta sub 0 and Psi sub 0 and in the relative reflectivity. The method is illustrated by an examination of the electrochemical formation of the anodic oxide film on platinum. Author (GRA)

N74-12829# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.

OPTICAL EVIDENCE CONCERNING THE DISCHARGE OF MnO2 IN ACID AND ALKALINE ELECTROLYTES

C. H. Lee, B. D. Cahan, and Ernest Yeager 1 Jul. 1973 19 p refs

(Contract N00014-67-A-0404-0006; NR Proj. 359-451)

(AD-766819; TR-32) Avail: NTIS CSCL 07/4

Optical transmission measurements have been made in situ on gamma-MnO2 during discharge in acid and alkaline solutions. The gamma-MnO2 was electrodeposited on a conducting tin oxide coated quartz flat. The optical data are compatible with disproportionation in acid media and the stepwise reduction in basic media. (Modified author abstract) GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-12830# Systems Science and Software, La Jolla, Calif.
CHEMICAL REACTION SYSTEMS SENSITIVITY STUDY Semiannual Report
J. H. Schaibly Sep. 1973 56 p refs
(Contract N00014-73-C-0270; ARPA Order 1479)
(AD-766817; SSS-R-73-1865) Avail: NTIS CSCL 07/4

A method has been developed to investigate the sensitivity of the solutions of large sets of coupled, non-linear rate equations to uncertainities in the rate coefficients. This method is based on varying all the rate coefficients simultaneously through the introduction of a parameter in such a way that the output concentrations become periodic functions of this parameter at any given time t. The concentration of the chemical species are then Fourier analysed at time t. The amount of numerical integration required is considerably less than that required in tests of sensitivity where one varies one rate coefficient at a time. The Fourier method developed in this paper is not limited to chemical rate equation, but can be applied to the study of the sensitivity of any large system of coupled, non-linear differential equations with respect to the uncertainties in the modeling parameters. The method is successfully applied to a five reaction system describing 6000 K dissociation of air and the nine reaction combustion of H2 and O2 at 2000 K. (Modified author abstract) GRA

N74-12831# Ballistic Research Labs., Aberdeen Proving Ground, Md.
MASS SPECTRAL CHARACTERIZATION OF SAMPLES FROM A POTASSIUM BROMIDE MATRIX
Arpad A. Juhasz, J. J. Rocchio, and J. Omar Doali Jul. 1973 17 p refs
(DA Proj. 1T0-61102-B-13A; DA Proj. 1T0-61102-A-33C)
(AD-767245; BRL-MR-2314) Avail: NTIS CSCL 07/3

Techniques were developed for mass spectral characterization of materials adsorbed on a potassium bromide (KBr) matrix. Samples intimately mixed with KBr are placed into a solids inlet probe and heated to volatilize the material into the mass spectrometer. The spectra obtained by this technique are essentially identical to spectra from neat samples. The method was found to be readily applicable to the analysis of a variety of propellant ingredients. Examples presented include diphenylamine, dinitrotoluene, 2-nitrodiphenylamine and ethyl centralite. Good mass spectra have been obtained from twenty microgram samples. This advance makes possible both infrared and mass spectral characterization of a single micro-sample. Author (GRA)

N74-12832# Naval Ammunition Depot, Crane, Ind.
THE CHEMICAL REACTIVITY OF FERRIC OXIDE
Charles A. Lipscomb, Jr. Jul. 1973 25 p refs
(AD-767346; NAD-CR-RDTR-249) Avail: NTIS CSCL 07/4

Ferric oxide may experience noticeable and sometimes drastic alterations in its physical properties and in the way it reacts chemically as well. This paper deals primarily with the effects of preparation temperature, selected impurities, and mechanical activation on such pyrotechnic properties as the heat of reaction and the preignition reaction temperature for the reaction: Fe2O3 - 3Ti to 3TiO - 2Fe. Author (GRA)

N74-12833# California Inst. of Tech., Pasadena. Dept. of Electrical Engineering.
REACTION KINETICS OF Pd AND Ti-Al FILMS ON Si
Robert W. Bower May 1973 126 p refs
(Contract F19628-73-C-0174; AF Proj. 5638)
(AD-767572; AFCRL-TR-73-0389; SR-1) Avail: NTIS CSCL 07/4

The growth of compound phases from thin film layers of Pd and Ti-Al deposited on Si is described in this work. The growth kinetics and composition of the compound phases were measured utilizing 2 MeV 4He backscattering. Crystalline structure and film texture effects of the compounds layers were measured by X-ray diffraction techniques. The Ti-Al metal system is used to make contact to Si in integrated circuit applications. Compound phases in this system can be directly related to severe erosion of metal -Si contact areas which result in failure of the integrated circuits. The rate kinetics are found to have practical application in predicting and controlling a failure mechanism in an integrated circuit metallization scheme. (Modified author abstract) GRA

N74-12834 British Broadcasting Corp., Kingswood (England). Research Dept.
TELEVISION RECEPTION OVER SEA PATHS: THE EFFECT OF POLARISATION
P. A. Laven Nov. 1973 11 p refs
(BBC-RD-1973/30) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Fading of UHF signals on oversea paths within the horizon can occur because of interference between the direct and sea-reflected signals. Comparisons of transmissions using horizontal polarization (HP) and vertical polarization (VP) have been made on short paths affected by fading. The results indicate that unacceptable fading can occur on either polarization, although fading on VP is generally less serious. Details are also given of a system using elliptical polarization to reject the sea-reflected signals, which is expected to offer a considerable improvement over HP or VP. Author

N74-12835 British Library Lending Div., Boston Spa (England).
ON RAYLEIGH WAVES GENERATED AT ROUGH SURFACES. 1: TWO DIMENSIONAL CASE
Ryosuke Sato [1973] 38 p refs Transl. into ENGLISH from J. of Seismological Soc. of Japan (Japan), v. 8, 1956 p 121-137 In ENGLISH and JAPANESE
(BLL-M-23127-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

A Rayleigh pulse is considered that is generated because of the irregularities when a plane density wave or a plane shear wave are incident to the configuration of the ground which is not plane. Approximative calculations show that during the propagation of a seismic wave, the Rayleigh wave is excited even before the seismic wave runs into a mountain formation. It is assumed possible that the Rayleigh wave arrives faster than expected because it is propagated at epicentral distance. Author

N74-12836 Wisconsin Univ., Madison.
WAVE PROPAGATION AND RADIATION NEAR A FERRITE INTERFACE Ph.D. Thesis
Dale Franklin Vaslow 1973 184 p
Avail: Univ. Microfilms Order No. 73-19333

Three related problems in electromagnetic theory are considered. The problems concern wave propagation and radiation in inhomogeneous, anisotropic media. The material medium of primary interest is a ferrite which has been magnetized by a magnetostatic field. Only small signal electromagnetic fields are considered, so that the magnetic properties of the magnetized ferrite are represented by the Polder permeability tensor. The electric properties of the ferrite are represented by a dielectric constant, except at very high frequencies where to a first approximation the ferrite is modeled as an isotropic, cold plasma. Dissert. Abstr.

N74-12837*# City Coll. of the City of New York. Dept. of Electrical Engineering.
OPTIMAL SPACE COMMUNICATIONS TECHNIQUES Status Report, 22 Jan. - 21 Jul. 1973
Donald L. Schilling 21 Jul. 1973 216 p refs
(Contract NGR-33-013-077)
(NASA-CR-132881) Avail: NTIS HC $13.00 CSCL 07B

The design, development, and analysis are reported of a digital phase-locked loop (DPLL) for FM demodulation and threshold extension. One of the features of the developed DPLL is its synchronous, real time operation. The sampling frequency is constant and all the required arithmetic and logic operations are performed within one sampling period, generating an output sequence which is converted to analog form and filtered. An equation relating the sampling frequency to the carrier frequency

must be satisfied to guarantee proper DPLL operation. The synchronous operation enables a time-shared operation of one DPLL to demodulate several FM signals simultaneously. In order to obtain information about the DPLL performance at low input signal-to-noise ratios, a model of an input noise spike was introduced, and the DPLL equation was solved using a digital computer. The spike model was successful in finding a second order DPLL which yielded a five db threshold extension beyond that of a first order DPLL. D.L.G.

N74-12838# Joint Publications Research Service, Arlington, Va.
RADAR IN WEATHER MODIFICATION AND HAIL CONTROL
19 Nov. 1973 26 p refs Transl. into ENGLISH from Tr. Vysokogornyy Geofiz. Inst. Leningrad), no. 20, 1972 p 114-126 and no. 21, 1972 p 168-175
(JPRS-60573) Avail: NTIS HC $3.50

The procedure and apparatus for measuring the attenuation of radar radiation in clouds and precipitation are described together with a discussion of the problems involved in the technical realization of radar measurements of hail. For individual titles, see N74-12839 through N74-12840.

N74-12839 Joint Publications Research Service, Arlington, Va.
PROCEDURE AND APPARATUS FOR MEASURING THE ATTENUATION OF RADAR RADIATION IN CLOUDS AND PRECIPITATION
M. T. Abshayev, Yu. A. Dadali, and M. M. Shamis *In its* Radar in Weather Modification and Hail Control (JPRS-60573) 19 Nov. 1973 p 1-14 refs Transl. into ENGLISH from Tr. Vysokogornyy Geofiz. Inst. (Leningrad), no. 20, 1972 p 114-126 (For availability see N74-12838 04-07)

The proposed procedure and apparatus are described along with an analysis of performance. It is concluded that: (1) The procedure for measuring the attenuation characteristics of centimeter and millimeter radar radiation permits automation by application of an additional base radar of the wave range in which the attenuation in the liquid drop clouds and precipitation is negligibly small. (2) The greatest accuracy of measuring the total attenuation and the attenuation factor in clouds and precipitation is achieved in the wave range of 1.7 to 2.0 cm. (3) In hail clouds, by using the proposed procedure and equipment, it is possible to measure only the total attenuation over the entire extent of the hail center. D.L.G.

N74-12840 Joint Publications Research Service, Arlington, Va.
PROBLEMS OF TECHNICAL REALIZATION OF RADAR MEASUREMENT OF HAIL
G. V. Vasilyev and M. T. Abshayev *In its* Radar in Weather Modification and Hail Control (JPRS-60573) 19 Nov. 1973 p 15-23 refs Transl. into ENGLISH from Tr. Vysokogornyy Geofiz. Inst. (Leningrad), no. 21, 1972 p 168-175 (For availability see N74-12838 04-07)

Methods of hail detection and measurement by radar examination are reviewed. Particular emphasis is placed on a method based on measuring the ratio of the radar reflectivity of a unit volume of the cloud for two wavelengths. A comparatively simple device is described which provides an automated and instantaneous measurement of hail size. D.L.G.

N74-12841*# Washington Univ., St. Louis, Mo. Program on Application of Communications Satellites to Educational Development.
COMPUTER-AIDED COMMUNICATION SATELLITE SYSTEM ANALYSIS AND OPTIMIZATION
Thomas W. Stagl, Nancy H. Morgan, Robert E. Morley, and Jai P. Singh Oct. 1973 167 p refs
(Grant NGR-26-008-054)
(NASA-CR-136201; R(T)-73/2) Avail: NTIS HC $10.50 CSCL 17B

The capabilities and limitations of the various published computer programs for fixed/broadcast communication satellite system synthesis and optimization are discussed. A satellite Telecommunication analysis and Modeling Program (STAMP) for costing and sensitivity analysis work in application of communication satellites to educational development is given. The modifications made to STAMP include: extension of the six beam capability to eight; addition of generation of multiple beams from a single reflector system with an array of feeds; an improved system costing to reflect the time value of money, growth in earth terminal population with time, and to account for various measures of system reliability; inclusion of a model for scintillation at microwave frequencies in the communication link loss model; and, an updated technological environment. Author

N74-12842*# Stanford Univ., Calif. Radioscience Lab.
MEASUREMENTS OF VLF POLARIZATION AND WAVE NORMAL DIRECTION ON OGO-F Final Report
R. A. Helliwell [1973] 40 p refs
(Contract NAS5-9309)
(NASA-CR-132882) Avail: NTIS HC $4.00 CSCL 20N

A major achievement of the F-24 experiment on OGO 6 was a verification of the theory of the polarization of proton whistlers. As predicted, the electron whistler was found to be right-hand polarized and the proton whistler left hand polarized. The transition from right- to left-hand polarization was found to occur very rapidly. Thus it appears that the experimental technique may allow great accuracy in the measurement of the cross-over frequency, a frequency that provides information on the ionic composition of the ionosphere. Author

N74-12843*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ADJUSTABLE FREQUENCY RESPONSE MICROPHONE Patent Application
Carl V. Rumble, inventor (to NASA) Filed 21 Nov. 1973 12 p refs
(NASA-Case-LAR-11170-1; US-Patent-Appl-SN-418010) Avail: NTIS HC $3.00 CSCL 17B

A frequency adjustable capacitance microphone is presented along with its design and construction costs. Operational reliability and adjustment accuracy are included. NASA

N74-12844# National Bureau of Standards, Washington, D.C. Systems Development Div.
USER PROCEDURES STANDARDIZATION FOR NETWORK ACCESS Interim Report
A. J. Neumann Oct. 1973 44 p refs
(Grant NSF AG-350)
(NBS-TN-799) Avail: SOD HC $0.70 as C13-46:799

User access procedures to information systems have become of crucial importance with the advent of computer networks, which have opened new types of resources to a broad spectrum of users. This report surveys user access protocols of six representative systems. Functional access requirements are outlined, and implementation of access procedures is analyzed by means of a common methodology. Qualitative assessment of standardization possibilities identify standardization candidates such as: system and user signals, on-line user entries, system requests, and network wide categories of message content. Author

N74-12845*# Office of Telecommunications, Boulder, Colo.
AN EXPERIMENTAL STUDY OF THE TEMPORAL STATISTICS OF RADIO SIGNALS SCATTERED BY RAIN
R. W. Hubbard, J. A. Hull, P. L. Rice, and P. I. Wells Jun. 1973 148 p refs Sponsored by NASA
(NASA-CR-136275; OT-73-15) Avail: NTIS MF $1.45; SOD HC $1.55 CSCL 17B

A fixed-beam bistatic CW experiment designed to measure the temporal statistics of the volume reflectivity produced by hydrometeors at several selected altitudes, scattering angles, and at two frequencies (3.6 and 7.8 GHz) is described. Surface rain gauge data, local meteorological data, surveillance S-band radar, and great-circle path propagation measurements were also made to describe the general weather and propagation conditions and to distinguish precipitation scatter signals from those caused by ducting and other nonhydrometeor scatter mechanisms. The data analysis procedures were designed to provide an assessment of a one-year sample of data with a time resolution of one minute. The cumulative distributions of the bistatic signals for all of the rainy minutes during this period are presented for the several path geometries. Author

N74-12846*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.

ESTIMATION AND DETECTION OF SIGNALS IN MULTIPLICATIVE NOISE

Alan S. Willsky 23 Oct. 1973 35 p refs

(Grant NGL-22-009-124)

(NASA-CR-136301; ESL-P-521) Avail: NTIS HC $3.75 CSCL 17B

A class of detection-estimation problems on matrix Lie groups is defined in which the observation noise is multiplicative in nature. By examining the differential versions of the hypotheses, which are bilinear in nature, it is possible to derive the relevant likelihood ratio formula and the associated optimal estimation equations for the signal given the observations and the assumption that the signal is present. These estimation equations are of interest in their own right, in that they represent a finite dimensional optimal solution to a nonlinear estimation problem and can be viewed as consisting of a Kalman-Bucy filter along with the on-line computation of the solution of the associated Riccati equation, which is driven by the observations. The usefulness of these results is illustrated via an example concerning the detection of an actuator failure in a rigid body rotational control system. Author

N74-12847*# Radiation, Inc., Melbourne, Fla. Systems Engineering Dept.

VHF COMMAND SYSTEM STUDY Final Report, Jun. 1972 - Jun. 1973

T. H. Gee and J. M. Geist Jun. 1973 202 p refs

(Contract NAS5-20358)

(NASA-CR-132888; Rept-7620-73-001) Avail: NTIS HC $12.25 CSCL 17B

Solutions are provided to specific problems arising in the GSFC VHF-PSK and VHF-FSK Command Systems in support of establishment and maintenance of Data Systems Standards. Signal structures which incorporate transmission on the uplink of a clock along with the PSK or FSK data are considered. Strategies are developed for allocating power between the clock and data, and spectral analyses are performed. Bit error probability and other probabilities pertinent to correct transmission of command messages are calculated. Biphase PCM/PM and PCM/FM are considered as candidate modulation techniques on the telemetry downlink, with application to command verification. Comparative performance of PCM/PM and PSK systems is given special attention, including implementation considerations. Gain in bit error performance due to coding is also considered. Author

N74-12848*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A ONE WAY DOPPLER TRACKING SYSTEM FOR SATELLITE TO SATELLITE TRACKING

J. W. Bryan and J. J. Lynn Oct. 1973 42 p refs Submitted for publication

(NASA-TM-X-70526; X-591-73-307) Avail: NTIS HC $4.25 CSCL 17I

An S-band tracking system employing one way Doppler applicable to the tracking and data relay system (TDRS) was evaluated. This evaluation is limited to the measurement system parameters. The analysis assumes state-of-the-art components such as spacecraft oscillator long term stability of one part in 10 to the 8th power and ground station oscillator stability of one part in 10 to the 11th power. Signal characteristics comparable with the present ranging systems are utilized in the analysis. Predicated upon measurement system parameters, position uncertainties for the low orbiting spacecraft vary from 5 meters to 2 kilometers along track, 4 meters to 1 kilometer cross track, and 1 meter to 180 meters radially depending upon the tracking geometry and the high satellite position and velocity error assumptions. Author

N74-12849*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

VIRGINIA PRECIPITATION SCATTER EXPERIMENT: DATA ANALYSIS

Robert K. Crane Oct. 1973 202 p refs Revised

(NASA-TM-X-70457; X-750-73-55-Rev) Avail: NTIS HC $12.25 CSCL 20N

Rain scatter and surface rain rate data were obtained from October 3, 1970 to October 2, 1971 using a bistatic radar system and tipping bucket rain gauges located in southeastern Virginia. The data showed that interference may occur between earth and terrestrial stations located within 80 km of each other either by mainlobe-to-mainlobe coupling or sidelobe-to-mainlobe coupling. The data further show that the distributions of scattering cross section per unit volume measured at several heights and estimated from surface rain gauge data were different. The density functions for the scattering cross section per unit volume values measured at a 3 km height and estimated from surface rain rate data were identical only for summer thundershowers. The data showed that the CCIR model used to estimate interference due to rain is inadequate because the cell size and change of scattering cross section per unit volume with height estimates of the model predict transmission loss values that are too low (more interference than will occur). Author

N74-12850# Lockheed Missiles and Space Co., Palo Alto, Calif.

RADAR STATION OPERATING PRINCIPLES

A. A. Nemets and V. I. Fedotov [1973] 20 p Transl. into ENGLISH of the book 'Osnovy Radiolokatsii i Televideniia" Moscow, Vysshaia Shkola, 1971 p 216-238

Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616 CSCL 17I

The methods by which vehicles can be tracked by radar stations are defined. The advantages and disadvantages of the methods are described. The subjects discussed are: (1) range tracking of a vehicle, (2) direction tracking of a vehicle, (3) monopulse method of angular coordinate measurement, and (4) radar countermeasures. Author

N74-12851# Lockheed Missiles and Space Co., Palo Alto, Calif.

RADIO INFORMATION TRANSMISSION SYSTEMS, CHAPTER 4

S. A. Volkovskii, E. I. Onoprienko, and V. A. Savinov [1973] 43 p refs Transl. into ENGLISH from the book "Radioustroistva Sistem Upravleniia Letatelnymi Apparatami" Moscow, Mashinostr., 1972 p 254-298

Avail: NTIS HC $4.25; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The functional block diagram of a radio information transmission system is presented that is one of the most important components in a flying vehicle control complex. Control is accomplished by coordinating flying vehicle crew operations with data obtained about the state of the flying vehicle by onboard systems and by transmitting scientific and special information from the flying vehicle by either the operator or digital computer. The system has multichannel capability for telemetry signal processing. G.G.

N74-12852# Lockheed Missiles and Space Co., Palo Alto, Calif.

CONVERGENCE OF PERTURBATION THEORY SERIES IN THE PROBLEM OF SHORTWAVE PROPAGATION IN A RADOMLY INHOMOGENEOUS MEDIUM

Iu. N. Barabanenkov [1973] 8 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radiofiz. (Gorki), v. 16, no. 7, 1973

Avail: NTIS HC $3.00; Natl. Translations Center, John Crerar Library, Chicago, Ill. 60616

The solution of the Leontovich parabolic equation describing shortwave propagation in a randomly inhomogeneous medium was investigated. It was assumed that the medium permittivity fluctuates according to a Gaussian law and the initial condition was given as a wave packet with square-integrable amplitude. It was shown that the perturbation theory series for the mean field over the ensemble, and the mutual field coherence function satisfying the parabolic equation, will converge in the norms of the appropriate Hilbert spaces for a very weak constraint on the form of the permittivity fluctuation correlation function and an arbitrary value of the distance traversed by the wave. Strict estimates were obtained for the errors in calculating the sums of these series by using the Dyson equation in the Burre approximation, formed by starting from the parabolic equation. The solution of the parabolic equation with Gaussian permittivity fluctuations was investigated without using any assumption that

these fluctuations were delta-correlated in the direction of wave incidence. Author

N74-12853# Lockheed Missiles and Space Co., Palo Alto, Calif.
THE HILBERT TRANSFORMATION AND PHASE DISTORTION OF SIGNALS
V. B. Minukhin [1973] 7 p refs Transl. into ENGLISH from Radiotekh. i Elektr. (Moscow), v. 18, no. 8, 1973 p 1628-1634
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The use of the Hilbert transformation to describe phase signal distortions was examined. The adequacy of the transformation of the physical phenomena in the system is shown by the example of magnetic recording and reproduction. Experimental results confirming the theory are presented. Author

N74-12854# Lockheed Missiles and Space Co., Palo Alto, Calif.
GENERALIZED STRUCTURE OF A NONRECURSIVE DISCRETE FILTER
I. A. Tsikin [1973] 7 p refs Transl. into ENGLISH from Radiotekh. Elektron. (USSR), v. 18, no. 8, 1973 p 1635-1641
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The matrix representation of the algorithm of nonrecursive discrete filter operation is examined. On the basis of such a representation, the generalized filter structure is introduced. A number of particular cases which are of interest for processing complex signals are considered. Author

N74-12855# National Aviation Facilities Experimental Center, Atlantic City, N.J.
INVESTIGATION OF RADIO-FREQUENCY INTERFERENCE TO THE BACKUP EMERGENCY COMMUNICATION EQUIPMENT Interim Report, 2-12 Apr. 1973
George Apostolakis, John Riley, and Arthur Moss Dec. 1973 80 p
(FAA Proj. 121-101-110)
(FAA-NA-73-57; FAA-RD-73-163) Avail: NTIS HC $6.00

Backup emergency communications (BUEC) equipment operation in the field has been reported imparied by radio frequency interference (RFI). This RFI was investigated at the Elwood, New Jersey, ARSR-2 radar site in April 1973. The investigation consisted of determining the interference frequencies from various sources which broke the squelch threshold of BUEC Very High Frequency (VHF) and Ultra High Frequency (UHF) transceivers with the BUEC antennas placed at various distances, directions, and positions with respect to the RFI sources. The investigation showed that two major sources of RFI were the common digitizer (CD) (with its doors open) and the radar. It was also found that the number of interference frequencies which break the squelch threshold diminish with increasing distance from the RFI source; that RFI from the CD shifts in distance and azimuth versus time; and that the RFI from the radar appears to come from the radar modulator, amplitron, and magnetron rather than from the radar antenna. Author

N74-12856# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTER PROGRAM FOR IONOSPHERIC WAVE PROPAGATION WITHIN THE MF AND HF BANDS [DATORPROGRAM FOER JONOSFAER VAEGUTBREDNING INOM MF- OCH HF-BANDEN]
Lars Ladell Feb. 1972 42 p refs In SWEDISH
(FOA-3-C-3703-E2) Avail: NTIS HC $4.25

A description and program lists are provided together with a result list, for a complete program written in FORTRAN 4 for CDC 3600. The program calculates the propagation path for a radio wave, within the MF and HF band (1 to 30 MHz), as it passes through the ionosphere. As a result the losses in the ionosphere are obtained as well as the propagation path. The report is mainly intended for users of the program. Author

N74-12857# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTER-ASSISTED METHODS FOR FREQUENCY ASSIGNMENTS IN THE BAND 118-136 MHz
Lars Bergman Oct. 1971 26 p
(FOA-3-C-3690-E2) Avail: NTIS HC $3.50

A short description is given of the computer-assisted methods used in the ICAO FCB study group and the preparations for the Sixth EUM RAN Meeting. The methods described are: (1) map drawing program; (2) matrix method; and (3) assignment program. Author

N74-12858# Research Inst. of National Defence, Stockholm (Sweden).
A STUDY OF THE INFLUENCE OF THE IONOSPHERE ON DIRECTION-FINDING IN THE SHORT-WAVE BAND [UNDERSOEKNING AV JONOSFAERENS INVERKAN PA PEJLING INOM KV-BANDET]
Willy Stoffregen and Hans Gunnarsson Nov. 1971 33 p refs In SWEDISH; ENGLISH summary
(FOA-3-A-3752-E1) Avail: NTIS HC $3.75

A number of experiments for studying the influence of ionosphere on short wave direction finding are reported. A direction finder of the Adock-type was operating at a distance approximately equal to 110 km from the transmitter. The frequency range used during these experiments was 1.5-13 MHz. It was found that appreciable deviations from the correct bearing are associated with diurnal variations of the critical frequencies, the tilt angle, and the structure of the involved ionospheric layers. An unexpected signal corresponding to the time of travel of the ground wave was recorded on frequencies up to 18 MHz. This signal is often the only one received by the direction finder. Author

N74-12859# Research Inst. for Physics, Stockholm (Sweden).
COMPARING THE MEASUREMENTS OF ANTENNA GAIN ON SOME ALTERNATIVE ANTENNA FOR THE FREQUENCY BAND 30-75 MHz [JAEMFOERANDE ANTENNVINSTMAETNINGAR PA NAGRA ANTENNALTERNATIV FOER FREKVENSBANDET 30-75 MHZ]
Viggo Westerlin Oct. 1971 25 p ref In SWEDISH
(FOA-3-C-3684-E2) Avail: NTIS HC $3.25

Results of measurements on different types of antenna for telecommunication in the range 30 to 75 MHz are presented. The measurements, together with field strength tests are intended to give the basis of a choice of VHF antenna for an Army unit. Author

N74-12860# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTER PROGRAM FOR IONOSPHERIC WAVE PROPAGATION WITHIN THE VLF AND LF BANDS [DATORPROGRAM FOER JONOSFAER VAGUTBREDNING INOM VLF-OCH LF-BANDEN]
Lars Ladell Feb. 1972 27 p refs In SWEDISH
(FOA-3-C-3702-E2) Avail: NTIS HC $3.50

The computer program which is written in FORTRAN 4 for CDC 3600 has been modified and adapted to current tasks. It integrates the coupled wave equations which determine the field strength in the ionosphere and as a final result, gives the reflection factors for plane waves. The program is suitable for wave propagation within the VLF and LF bands and for relatively restricted ground distance between transmitter-receiver. Description and program lists for the complete program and a result list as a test are presented. The accuracy has been determined as better than 5% for the frequencies 20 to 150 kHz. The report is written mainly for users of the program. Author

N74-12861# Research Inst. of National Defence, Stockholm (Sweden).
A METHOD FOR MECHANICAL FREQUENCY ALLOTMENT FOR RADIO COMMUNICATION WITHIN THE ICAO EUROPEAN REGION [METOD FOER MASKINELL FREKVENSTILLDELNING FOER RADIOKOMMUNIKATION INOM ICAO EUROPAREGION]
Lars Bergman Dec. 1971 53 p refs
(FOA-3-A-3753-E2) Avail: NTIS HC $4.75

Three aids for alloting frequencies within the communication band 118 to 136 MHz are considered, namely: A map drawing program, the matrix method and the allotment program. Programs for preparing separation and allotment matrices for the matrix

method and also for the allotment program are described.
Author

N74-12862# Research Inst. of National Defence, Stockholm (Sweden).
APPLIED EXPERIMENTS WITH LOW LIGHT TV FOR REPRODUCTION UNDER WATER [ORIENTERANDE FORSOK MED LAGLJUS-TV FOR AVBILDNING UNDER VATTEN]
Berndt Andersson, Olle Andersson, Rune Bergqvist, Sten Nordlander, and Tryggve Ramqvist Oct. 1971 33 p In SWEDISH
(FOA-2-C-2488-E1) Avail: NTIS HC $3.75

Low light TV systems have been demonstrated as usable at illumination strengths down to 1 mlux. The report gives an account of some applied experiments carried out with LL TV at about 30 m depth in the Gullmar fjord, in Spring 1971. The strength of illumination at different depths was also measured. As long as the level of illumination of the natural light was sufficient for LL TV it was shown that the range of the system was significantly better when artificial lighting sources were not used - this is because of their contrast reducing back-scatter. It is concluded that in full daylight a LL TV system should be capable of being used at depths of 100 to 150 m without artificial light sources. Author

N74-12863# European Space Research and Technology Center, Noordwijk (Netherlands).
CHOICE OF OPTIMUM TDMA TRANSMISSION SYSTEM
Mario Lopriore and Leif Lundquist 1972 12 p refs Presented at the 2nd Intern. Conf. on Digital Satellite Commun., Paris, 28-30 Nov. 1972
(COM/1787/SYS/LL/mt) Avail: NTIS HC $3.00

Optimal configuration and nonlinear travelling wave tube characteristics for a digital satellite communication channel are discussed. The proposed configuration consists of a Nyquist filtered channel incorporating nonlinear element and elimination at input and output stages of the parasitic adjacent channels. Cosine roll off filters were used. Degradation of the signal is shown for various bit rates as a function of the percent roll off. The degradation due to various types of possible in-band distortion is also discussed. Filtering at the ground station is analyzed and the earth station filter design is discussed. ESRO

N74-12864# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 1: DEFINITION SPECIFICATIONS. PART 1: GENERAL PRESENTATION OF THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER AND ITS SOFTWARE [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. SPECIFICATIONS DE DEFINITION. TOME 1: PRESENTATION GENERALE DE L'ASCC ET DE SON SOFTWARE]
5 Jul. 1973 69 p In FRENCH
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/309; ESRO-CR(P)-307) Avail: NTIS HC $5.50

A general presentation of the ASCC/ASET to be used within the Aerosat program is given. Chapter 1 details the ASCC functions and its responsibilities for communication, surveillance, ground-air-ground links, channel allocations (dynamic and static), and role of the human operator. Chapter 2 emphasizes the necessity of real time simulation, discussing the general characteristics of the simulation and the methods to be used. Chapter 3 gives the basic concepts of real time operational systems with regard to the identified needs and technical solutions and programming language. It separates the operational computer programs (communications, surveillance, control) from the simulation programs (communication management, aerosat, mobiles, ATC, operator). Chapter 4 details the hardware configuration of the ASCC/ASET in terms of operational and simulation elements.
ESRO

N74-12865# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 1: DEFINITION SPECIFICATIONS. PART 2: DESCRIPTION OF OPERATIONAL AND SIMULATION FUNCTIONS [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. SPECIFICATIONS DE DEFINITION. TOME 2: DESCRIPTION DES FONCTIONS OPERATIONNELLES. DESCRIPTION DES FONCTIONS DE SIMULATION. ANNEXE]
5 Jul. 1973 219 p In FRENCH
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/305; ESRO-CR(P)-308) Avail: NTIS HC $13.00

A description of the operational and simulation functions for the ASCC/ASET of the AEROSAT program is presented. Data cover: communication function with regard to call procedures as a function of accessing methods, information transfer procedures as a function of the communication mode channel attribution and archives; surveillance with regard to mobile localization data access; control with regard to control modes, messages, management, files, data blocks, and archives; the simulation functions with regard to communication management, AEROSAT, mobiles, ATCC, operators simulation preparation, and off-line simulation analysis, and the operational system with regard to task program structure, task communication, segments, control memory management, and implementation. ESRO

N74-12866# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 2: PROGRAMMING SPECIFICATIONS. PART 1: SOFTWARE ORGANIZATION AND GENERAL DESCRIPTION [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. SPECIFICATIONS DE PROGRAMMATION. TOME 1: ORGANISATION ET DESCRIPTION GENERALE DU SOFTWARE]
3 Jul. 1973 85 p In FRENCH
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/296; ESRO-CR(P)-309) Avail: NTIS HC $6.25

The programming specifications for the ASCC/ASET part of the Aerosat program are presented. Discussions cover the following: (1) hardware configurations and emission/reception routines for messages; (2) general description of the application software; (3) I/O routine modules description; and (4) operational system and programming language. The I/O routine modules are detailed according to the general layout set up with regard to data management. Flow charts for every module are given. The programming languages for various subsystem data managements are specified. ESRO

N74-12867# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 2: PROGRAMMING SPECIFICATIONS. PART 2: DESCRIPTION OF OPERATIONAL FUNCTIONS [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. SPECIFICATIONS DE PROGRAMMATION. TOME 2: DESCRIPTION DES FONCTIONS OPERATIONNELLES]
5 Jul. 1973 224 p In FRENCH
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/308; ESRO-CR(P)-310) Avail: NTIS HC $13.25

The description of the operational functions of the ASCC/ASET for the Aerosat program, namely communication, surveillance, and control, are presented. The communication function is discussed with regard to the main modular programs, including request treatment modes and polling communication. Secondary modules are also dealt with together with special modules for access mode giving initiative to mobiles. The same structure is followed in chapter 2: surveillance with regard to mobile surveillance modular programs (main modules), channel attribution, and management programs (second modules). Data structures

and archives are also detailed. Chapter 3 deals with the control function and is devoted to satellite data. ESRO

N74-12868# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 2: PROGRAMMING SPECIFICATIONS. PART 3: DESCRIPTION OF SIMULATION FUNCTION [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. SPECIFICATIONS DE PROGRAMMATION. TOME 3: DESCRIPTION DES FONCTIONS DESIMULATION]
4 Jul. 1973 228 p
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/299; ESRO-CR(P)-311) Avail: NTIS HC $13.50

The description of the simulation functions for the ASCC/ASET of the Aerosat program is presented. Part A, devoted to simulation program structure, contains six chapters divided as follows: (1) communication functions; tasks of interface, user communication, communication activation, and archives; (2) aerosat function; surveillance response task, satellite link state, and range calculation; (3) mobile functions; mobile position update, navigation error correction, dummy roll-call, and mobiles' method of navigation; (4) ATCC functions; process surveillance position report, process position report request, new mobiles initiation, surveillance priority change request, mobile deletion, and ATCC event activation; (5) operator functions; task of input, error display, operator implementation, EDD operator display, and SDD operator display; and (6) preparation and analysis software; software for simulation preparation and simulation analysis. Part B is devoted to the simulation data structure with the same subdivisions pertinent to sections one to five of part A. ESRO

N74-12869# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 3: DEFINITION OF THE MEANS [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. DEFINITION DES MOYENS]
6 Jul. 1973 85 p In FRENCH
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/311; ESRO-CR(P)-312) Avail: NTIS HC $6.25

The software evaluation for ASCC/ASET of the Aerosat program is presented with regard to computer memory requirements and program execution times. The evaluation hypotheses for programs and data volumes, the minimal core memory estimations, secondary memories occupation and central memory occupation are described as functions of test configurations. The program execution time hypotheses are considered together with estimates for central memory resident time and estimates of execution times by function and test configuration. The hardware configuration are discussed with regard to the interfaces, link ASCC-autocommutator, links ASCC-ASET and standard hardware. The reliability of the various Aerosat ground segment elements are discussed. The topics of modularity and program independence with regard to operational, simulation, and maintenance modules are reviewed. ESRO

N74-12870# Software et Engineering des Systemes d'Informatique et d'Automatique, Paris (France).
SOFTWARE DEFINITION STUDY FOR THE AERONAUTICAL SATELLITE COMMUNICATIONS CENTER. VOLUME 4: PLANNING [ETUDE DE DEFINITION DU SOFTWARE POUR LE CENTRE DE COMMUNICATIONS DES SATELLITES AERONAUTIQUES. PLANIFICATION]
6 Jul. 1973 43 p In FRENCH
(Contract ESTEC-1777/72-SK)
(EX-5102/27-73/315; ESRO-CR(P)-313) Avail: NTIS HC $4.25

The time table and cost estimate for the ASCC/ASET of the Aerosat program are presented. Data cover basic hardware (interfaces, computer, computer programs, ATCC, operators), and tasks to be performed-choice of hardware, choice of basic software, program writing and validation, integration test, tests of the various functions of communication, surveillance, control, and definition of a convenient operational system. Cost estimates in terms of total number of instructions and required personnel are dealt with. ESRO

N74-12871# Admiralty Surface Weapons Establishment, Portsmouth (England).
HIGH RESOLUTION LAND CLUTTER CHARACTERISTICS
C. J. Rigden Jan. 1973 26 p refs
(TR-73-6; BR36678) Avail: NTIS HC $3.50

An investigation into land clutter characteristics using a monostatic radar with the high range resolution associated with an effective pulse width of about 15 nanoseconds was carried out. The radar used operated at 5750 MHz, and the range resolution of 15 nanoseconds was achieved by using a 100 MHz bandwidth signal processing system which included 200 to 1 pulse compression. The data acquisition was carried out by short duration peak amplitude sampling of the clutter returns from fixed bearings at consecutive 6.25 nanoseconds steps in range, over several microseconds of radar range, using an on-line digital computer. The mean clutter amplitude from several seconds of sampling at each range step was calculated and stored on paper tape for subsequent analysis. Author (ESRO)

N74-12872# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
STATISTICAL ANALYSIS OF SHORTWAVE FADEOUT OCCURRENCE FOR THE YEARS 1955 TO 1969
Richard G. Hendl and Robert A. Skrivanek 28 Jun. 1973 22 p refs
(AF Proj. 8666)
(AD-767186; AFCRL-ERP-452; AFCRL-TR-73-0385) Avail: NTIS CSCL 20/14

Shortwave fadeout data for the period 1955 through 1969 were analyzed and correlated with solar flare data for the same period. Details of the analysis are presented along with various statistical presentations of the data. The validity of computerized objective procedures for matching geophysical data is shown. Some doubt is cast on the quality of the shortwave fadeout data during the early part of the period considered.
Author (GRA)

N74-12873# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Space Physics Lab.
CORRELATIONS OF SOLAR AND GEOPHYSICAL PARAMETERS-SHORTWAVE FADEOUTS AND SOLAR OPTICAL FEATURES
Ronald T. Podsiadlo 12 Jul. 1973 15 p refs
(AF Proj. 8666)
(AD-767187; AFCRL-ERP-453; AFCRL-TR-73-0411) Avail: NTIS CSCL 20/14

Shortwave fadeout durations are compared with associated solar flare characteristics and other features of the solar regions in which the flares occur. Statistical tests show that flare parameters, especially flare importance, have the highest correlations with shortwave fadeout duration. Most other active region features, such as plage area, also show some correlation, but to varying lesser degrees. Cross tabulations of the shortwave fadeout durations and optical features are presented and discussed relative to their use as operational space forecasting aids. Author (GRA)

N74-12874# Army Electronics Command, Fort Monmouth, N.J.
COMPUTER-AIDED DESIGN OF RADAR SIGNALS USING THE AMBIGUITY FUNCTIONS
John V. Medea Sep. 1973 73 p
(DA Proj. 1S1-62701-A-042; DA Proj. 1S6-63715-D-091)
(AD-767238; ECOM-4149) Avail: NTIS CSCL 17/9

The report documents the development of a computer-aided design program for determining the resolving power of radar signals from their ambiguity functions. The program computes the ambiguity function for any finite signal envelope and displays it on a graphics terminal. It is currently operational on the PDP-9/339 Remote Graphics Terminal and the Tektronix 4010 terminals at the University of Michigan. Author (GRA)

N74-12875# Telcom, Inc., McLean, Va.
PROGRAMMABLE FRONT-END PROCESSORS APPLIED TO DIGITAL DATA COMMUNICATIONS SYSTEMS Final Technical Report
Philip C. Wood and Charles Riviere Jul. 1973 120 p refs
(Contract F30602-72-C-0419; AF Proj. 4594)
(AD-767568; RADC-TR-73-183) Avail: NTIS CSCL 17/2

The report covers investigation of typical data communications loadings and facility utilizations developed in systems employing the IBM-360/50 class of computers with hardwired communications controllers and programmable front-end processors. Simulation techniques were used to model applicable configurations and traffic distributions. Comparisons of IBM-360/50 with hardwired communications controllers, upgraded configurations of IBM-360/65 with hardwired communications controllers as well as IBM-360/50 with programmable front-end processors are made. The latter is shown to be the most cost-effective approach for data communications systems. Author (GRA)

N74-12876# Office of Telecommunications, Boulder, Colo.
MICROWAVE COMMUNICATION LINKS AT 15 GHz
A. P. Barsis, C. A. Samson, and H. T. Dougherty Jul. 1973 66 p refs Sponsored by the Army
(AD-767545; OTM-73-142; SCC-ACO-2-73) Avail: NTIS CSCL 17/2

The report examines the feasibility of using frequencies around 15 GHz for point-to-point wideband communication links. First, system parameters are summarized and initial estimates of long-term median performance are presented. This is followed by a discussion of precipitation and other atmospheric effects on line-of-sight propagation at 15 GHz. Next, the effects of rainfall and of the statistics of rain rate distributions are applied to system performance estimates, and potential system reliability and outage time are determined. The report includes also a discussion of available equipment components, and a brief analysis of the use of the 15 GHz band for transhorizon links. An alternative method for determining rainfall probabilities is given in the appendix. Author (GRA)

N74-12877# Computer Sciences Corp., Falls Church, Va.
TIME DIVISION MULTIPLE ACCESS (TDMA) NETWORK CONTROL STUDY Final Report, Oct. 1972 - Jun. 1973
Gabriel Frenkel, George V. Kinal, Diwakar G. Gan, and John E. Dogett Aug. 1973 149 p refs
(Contract F30602-73-C-0057)
(AD-767218; RADC-TR-73-270) Avail: NTIS CSCL 17/2

The report presents the results of an effort devoted to the development of network control techniques for a Time Division Multiple Access (TDMA) Tactical Satellite Communications System. The study is subdivided into two major phases. Phase I is devoted to the development of the network control system and the associated computer program required for its implementation. Phase II studies the extension of the approach to network control techniques unrestricted by the capabilities of the existing modem and computer. In Phase II, after defining basic satellite, earth terminal and network parameters, the TDMA frame formats and enhanced control techniques are described. Additional topics covered are improvements in modem and satellite design, computer selection and extended software features. (Modified author abstract) GRA

N74-12878# Naval Postgraduate School, Monterey, Calif.
HIGH FREQUENCY PROPAGATION ANOMALIES M.S. Thesis
Daniel Victor Stapleton, Jr. Jun. 1973 85 p refs
(AD-767657) Avail: NTIS CSCL 20/14

A search was made for propagation anomalies using a large quantity of high frequency data produced as a byproduct of BRIGHAM, a Department of Defense project. The BRIGHAM data is based on 800 KHz wide samples of the HF spectrum at a 25 cycle rate, using a 2.8 KHz resolution for a duration of approximately 2.5 minutes. This method of data collection is unique and it was hoped that propagation anomalies, including wide band anomalies, might be detected. Anomalies are believed to occur in the propagation of radio signals and they are usually other than known, routine effects but may include known effects which cannot adequately be explained. The scope of the examination was limited to the visual analysis of computer processed data presented on an interactive graphics unit. Author (GRA)

N74-12879# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
ON OPTICAL ALTERNATIVES TO MICROWAVE LOS COMMUNICATION SYSTEMS
Harold T. Dougherty Jul. 1973 25 p refs
(SCC Proj. 403-73)
(AD-767546; SSC-ACO-3-73) Avail: NTIS CSCL 17/2

The feasibility of using systems operating in the infrared and visible portions of the spectrum is examined as an alternative to wide-band microwave systems operating below 10 GHz. The atmospheric limitations for optical systems are described briefly as are the factors determining system reliability. It is concluded that, for the present, systems operating at optical frequencies are a less desirable alternative than those operating at 10 to 20 GHz, for wide-band long-haul communications. Author (GRA)

N74-12880# Technology Service Corp., Santa Monica, Calif.
ADAPTIVE RADAR TECHNIQUES. VOLUME 1: COMPUTER STUDIES OF ADAPTIVE SUBARRAY RADAR Final Report
Worthie L. Doyle and Lawrence E. Brennan Griffiss AFB, N. Y. RADC Jul. 1973 138 p refs 2 Vol.
(Contract F30602-72-C-0253)
(AD-767209; TSC-PD-353-2-1; RADC-TR-73-194-Vol-1) Avail: NTIS CSCL 17/9

The final report on an adaptive radar techniques is contained in two volumes. The second volume discusses angle tracking with adaptive array radar. Volume I discusses adaptive array antenna techniques for ground-based radar and contains a generalized computer program for investigation of adaptive array radar in an environment containing jammers and/or distributed clutter. In many-element arrays, complexity can be reduced by forming subarray outputs which are then combined with adaptively controlled weights. This reduces the number of adaptive control circuits at some cost in array performance. Various types of subarraying are compared. The report also discusses the use of a notched-omni transit signal to permit adaptive sidelobe reduction when clutter or chaff extends into the main beam. Performance of various adaptive antenna configurations in a blinking jammer environment is considered. Author (GRA)

N74-12881# Technology Service Corp., Santa Monica, Calif.
ADAPTIVE RADAR TECHNIQUES. VOLUME 2: ANGLE TRACKING WITH AN ADAPTIVE ARRAY Final Report
Roderic C. Davis and Lawrence E. Brennan Griffiss AFB, N. Y. RADC Jul. 1973 52 p refs 2 Vol.
(Contract F30602-72-C-0253)
(AD-767210; TSC-PD-353-2-2; RADC-TR-73-194-Vol-2) Avail: NTIS CSCL 17/9

The final report on an adaptive radar techniques study is contained in two volumes. The first volume contains the results of a computer study of adaptive receiving array antennas for radar. This Volume II describes a technique for angle tracking with adaptive array antennas. As in conventional monopulse systems, two receiving beams are formed: a sum beam (Sigma) and a difference beam (Delta). Each of these beams is formed with adaptively controlled weights which generate antenna patterns with nulls on sidelobe jammers. Since the array weights and antenna patterns vary with the external noise field distribution, the conventional angle estimator Sigma/Delta does not provide an accurate angle estimate. An expression for estimating target angle off boresight, based on the Sigma and Delta beam outputs and the adaptive weights, is derived in this report. Simulation results show that this angle estimation equation and the adaptive Sigma and Delta array outputs provide good angle tracking accuracy in jamming environments where conventional non-adpative monopulse tracking fails. Author (GRA)

N74-12882# Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
OPTICAL FIBER LINKS FOR TELECOMMUNICATIONS, PART 2
Robert L. Gallawa, A. G. Hanson, R. B. Handwick, and M. Kayama Jul. 1973 150 p refs

(SCC Proj. 418-72)
(AD-767544; SCC-ACO-1-73-Pt-2) Avail: NTIS CSCL 17/2

The report is addressed to the application of glass fiber optical waveguides to military communication systems. The technical depth of the report is not substantial and hence it can serve as an introduction to the subject. The report contains a review of military requirements, a review of the state of the technology, and a list of recommendations for further work. The latter is broken into two time frames, indicating certain tasks which have a bearing on the mid-1980's time frame. The report contains the justification for the recommendations, which suggest work that could provide the interface between the state of the technology and a workable communication system.

Author (GRA)

N74-12883# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
NUMERICAL TECHNIQUES FOR THE ANALYSIS OF DIGITAL RADAR DATA WITH APPLICATIONS TO METEOROLOGY AND HYDROLOGY Technical Report
Douglas R. Greene Jul. 1973 145 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A)
(AD-767554; A/M-Ref-71-24-T; ECOM-0073-T-4-68; TR-4)
Avail: NTIS CSCL 17I

Investigation has been conducted on the feasibility of using digital radar for real-time meteorological and hydrological applications. Numerical techniques have been developed that enhance the usefulness of weather radar data in these applications. Through the use of digital radar data measured at successive elevation angles in a storm system, an analysis technique is developed that presents a new dimension in mesoscale analysis and gives means of detecting areas of explosive development in severe storms. This indicator presents the three-deimensional characteristics of a storm system in a two-dimension display of vertically-integrated liquid-water content (VIL). Constant altitude reflectivity maps, CAPPI type displays, which are useful in mesoanalysis and/or the study of thunderstorm dynamics, also may be generated from digital radar data. The VIL-analysis technique is used to investigate several tornado-producing meso-systems by use of digital weather radar data collected by the National Severe Storms Laboratory, NOAA, Norman, Oklahoma. (Modified author abstract) GRA

N74-12884# Office of Naval Research, London (England).
CONFERENCE ON SATELLITE SYSTEMS FOR MOBILE COMMUNICATIONS AND SURVEILLANCE
I. G. Kinnie and A. H. Waynick 20 Jul. 1973 38 p Conf. held at London, 13-15 Mar. 1973
(AD-767369; ONRL-C-14-73) Avail: NTIS CSCL 17/2

A fairly detailed report is presented on an international conference on the use of satellite systems for intercontinental mobile communications and surveillance. These have been termed an Aerosat system for commercial aircraft and a Marsat system for ships. Some details on the operation of the Skynet military satellite communications system are also reported upon.

Author (GRA)

N74-12885# Alabama Univ., Huntsville.
STUDIES OF MULTIPLE TARGET TRACKING, CONSTANT-FALSE ALARM-RATE AND GLINT FOR THE EAR SYSTEM Interim Technical Report, May 1972 - May 1973
Robert J. Polge, Roy D. Hays, B. K. Bhagavan, Louis Callas, and Earl R. McKee Jul. 1973 164 p refs
(Contract DAAH01-71-C-1181)
(AD-767298; UAH-RR-147) Avail: NTIS CSCL 17/9

The report is a continuation of the experimental array radar simulation studies. The main objectives are to: (1) expand and exercise the baseline EAR simulation program to include multiple target handling, (2) analyze and design a constant-false-alarm rate processor, and (3) investigate the effect of glint error on tracking performance and glint reduction through the use of linear FM frequency agility or both. (Modified author abstract) GRA

N74-12886# Research Inst. of National Defence, Stockholm (Sweden).
THE EFFECT OF TERRAIN ON THE RADIATION DIAGRAM OF BROAD BAND ANTENNAE DURING ACTIVE SERVICE USING THE FREUQUENCY RANGE 33 TO 75 MHz [TERREAENGENS INVERKAN PA BREDBANDSANTENNERS STRALNINGSDIAGRAM UNDER FALTMAESSIG ANVAENDNING I FREKVENSOMRADET 33-75 MHZ]
Lennart Nilsson Nov. 1971 20 p ref In SWEDISH
(FOA-3-C-3691-E2) Avail: NTIS HC $3.00

The effect of the terrain on the radiation characteristics of a directional antenna is studied in combination with the variations in antenna configuration which can arise with different mounting alternatives during use on active service. The antenna directional diagram is not appreciably influenced by the orientation of the top umbrella end cap nor the axis of the antenna in a vertical plane assuming that the axis is set up in the best way. Antenna gain deteriorates at frequencies around 33 and 66 MHz if the top umbrella end cap is wholly removed. Changes in directivity appear at 50 MHz and also very small variations in axial direction depending for example, on swaying on a tree mounting. Polar diagram measurements on an omni-directional antenna placed high in a tree and on the direction antenna mounted on a tree show that the expected high gain of the latter antenna is greatly reduced because of the higher degree of coupling between the antenna and the surrounding terrain.

Author

N74-13526 International Geophysical Year World Data Center A, Asheville, N.C.
SOLAR RADIO DATA
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 1 Jul. 1973 p 167-285 refs (For availability see N74-13523 04-29)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-12887* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DIGITAL SECOND-ORDER PHASE-LOCKED LOOP Patent
Jack K. Holes, Christopher Carl, and Carl R. Tegnelia, inventors (to NASA) Issued 4 Dec. 1973 9 p Filed 18 Sep. 1972 Supersedes N73-12192 (11 - 03, p 0270) Sponsored by NASA
(NASA-Case-NPO-11905-1; US-Patent-3,772,272;
US-Patent-Appl-SN-290030; US-Patent-Class-329-104;
US-Patent-Class-178-88; US-Patent-Class-325-320;
US-Patent-Class-329-122; US-Patent-Class-329-126) Avail: US Patent Office CSCL 09B

A digital second-order phase-locked loop is disclosed in which a counter driven by a stable clock pulse source is used to generate a reference waveform of the same frequency as an incoming waveform, and to sample the incoming waveform at zero-crossover points. The samples are converted to digital form and accumulated over M cycles, reversing the sign of every second sample. After every M cycles, the accumulated value of samples is hard limited to a value SGN = + or - 1 and multiplied by a value delta sub 1 equal to a number of n sub 1 of fractions of a cycle. An error signal is used to advance or retard the counter according to the sign of the sum by an amount equal to the sum.

Official Gazette of the U.S. Patent Office

N74-12888* Lockheed Electronics Co., Houston, Tex.
DATA STORAGE, IMAGE TUBE TYPE Patent
Phillip C. Lipoma, inventor (to NASA) Issued 11 Dec. 1973 6 p Filed 28 Jun. 1972 Supersedes N72-27215 (10 - 18, p 2399) Sponsored by NASA
(NASA-Case-MSC-14053-1; US-Patent-3,778,786;
US-Patent-Appl-SN-266899; US-Patent-Class-340-173CR;
US-Patent-Class-340-173LM; US-Patent-Class-328-123) Avail: US Patent Office CSCL 09B

Method and apparatus for the storage of digital or analog electrical signals are provided by a memory storage system employing a conventional vidicon tube. At the beginning of an operating cycle, the vidicon is conditioned to accept electrical data input by exposing its photosensitive target to a short, high intensity light flash. A first electron beam scan of the photosensi-

tive surface then sets up a charge pattern on the photosensitive target. A second electron beam scan of the photosensitive surface by an unmodulated electron beam then develops an output signal across an output resistor by using capacitive currents. The conditioning and scanning steps are operated repetitively at high speed using conventional television camera scan, sync, and power supply circuitry to provide a low cost data storage system.
Official Gazette of the U.S. Patent Office

N74-12889 British Library Lending Div., Boston Spa (England).
THE FAST FOURIER TRANSFORM (FFT) IN THE COMPUTERISED ANALYSIS OF ANALOG AND DIGITAL LINEAR SYSTEMS
U. Mazzei Nov. 1973 31 p refs Transl. into ENGLISH from Elettronica e Telecommun. (Italy), v. 21, no. 6, Nov. - Dec. 1973 p 225-233
(BLL-DRIC-Trans-3279-(3623.66); BR30607) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Theoretical and practical points of view are considered for technique known as the Fast Fourier Transform (FFT) which makes it possible to carry out Fourier analysis by means of a computer at high speeds and with high precision. Various aspects relating to the application of FFT to the analysis of digital and analog systems are examined and some illustrative examples are given of the application of the technique to problems relating to filters. In all cases the universality and facility of the application of this method are stressed. The calculating programs are described.
Author

N74-12890 British Library Lending Div., Boston Spa (England).
A CODE FOR CORRECTING BURSTS OF ERRORS AND ITS USE IN EXCHANGING INFORMATION BETWEEN COMPUTERS
G. M. Tenengolts, A. A. Davydov, and G. L. Tauglikh Sep. 1973 17 p refs Transl. into ENGLISH from Probl. Peredachi Inform. (Moscow), v. 8, no. 3, 1972 p 27-37
(BLL-RTS-8454) Avail: British Library Lending Div., Boston Spa, Engl.: £1.60; 5 BLL photocopy coupons

A code is proposed for correcting single bundles of errors which can be programmed on a computer. This code has less redundance and requires somewhat simpler apparatus than the existing Fire code.
Author

N74-12891 British Library Lending Div., Boston Spa (England).
DATA PROCESSING IN SPECTROMETRY
S. Minami Sep. 1973 22 p refs Transl. into ENGLISH from Kotai Butsuri (Japan), v. 7, no. 7, 1972 p 38-45
(BLL-RTS-8104) Avail: British Library Lending Div., Boston Spa, Engl.: £2.10; 7 BLL photocopy coupons

Techniques applied to waveform processing and the arithmetical operations of such processing in spectrometry are analyzed.
E.H.W.

N74-12892# Electrotechnical Lab., Tokyo (Japan).
PATTERN RECOGNITION SYSTEMS: ON THE BASIS OF THE FEATURE EXTRACTION TECHNIQUE Researches of the Electrotechnical Lab., no. 739
Yoshio Noguchi Apr. 1973 107 p refs
Avail: NTIS HC $7.50

Research is reported on pattern classification systems leading toward the development of a high performance optical character reader. The systems are based on the Karhunem-Loeve expansion technique and two techniques developed from it. One system has a feature space which equalizes the measurements of information extracted on each axis in the subspace. The other system suppresses variations of expansion coefficients caused by noise. In both systems a code word matching system is used as a pattern classification method after encoding the expansion coefficients of a pattern. The data patterns used in computerized simulations of these systems encorporate 46 typed style characters of the Japanese Katakana alphabet. A preprocessing theory for treating an observed pattern is discussed along with a normalization technique, blurring processing, and canonicalization processing.
Author

N74-12893# Research Inst. of National Defence, Stockholm (Sweden).
DRAFT OF A SYNTAX FOR A COMPUTER ANALYSIS OF SWEDISH [UTKAST TILL EN SYNTAX FOER DATAMASKINELL ANALYS AV SVENSKA]
Siv Sjoegren Feb. 1972 37 p refs In SWEDISH
(FOA-P-C-8314-M3(E5)) Avail: NTIS HC $4.00

The Swedish question and answering project is an experimental research project aimed at a question/answering computer system. The external language chosen is semi-natural Swedish. This very preliminary report deals with the arrangement of a syntax for Swedish; the difficulties are modifications that must be undertaken and the form of the syntax.
Author

N74-12894# Research Inst. of National Defence, Sundbyberg (Sweden).
DETEF: A SYSTEM FOR HANDLING FILES IN PDP-8/1 [DETEF: ETT SYSTEM FOER FILHANTERING I PDP-8/1]
Carl Reuterswaerd Nov. 1971 30 p In SWEDISH
(FOA-1-C-1430-C4) Avail: NTIS HC $3.50

A program system for handling program and data files by DEC tape in a PDP-8/1 with at least 4 k 12 bit words and a tape transport is reported. The system monitor covers permanently only one memory page (128 words). The system comprises, besides the monitor with a fixed section on the tape, a number of help programs for transcribing file registers, file copying, etc. All PDP 8 assembly programs of the recognized form can be managed and performed in the DETEF system, which furthermore, places special resources for arranging programs which are particularly adapted to this.
Author

N74-12895# Research Inst. of National Defence, Stockholm (Sweden).
INTERNATIONAL CONFERENCE ON INFORMATION SCIENCE
Rolf Gezelius Jan. 1972 22 p refs In SWEDISH Conf. held at Tel Aviv, Israel, 29 Aug. - 3 Sep. 1971
(FOA-3-C-3704-E8) Avail: NTIS HC $3.25

The ten sessions dealt with national and international information systems, information analysis, information economy, the effectivity in recovery of information, education, reprography, commercial information services, system analysis within the sphere of information and operative systems. A brief outline is given of the Israeli organizations for information and the range of documentation.
Author

N74-12896# Research Inst. of National Defence, Stockholm (Sweden).
INTEGER SCALING AS A PICTURE PROCESSING OPERATION
Jan-Olof Eklundh Feb. 1972 24 p refs
(FOA-2-C-2523-E1) Avail: NTIS HC $3.25

A method is given for picture quantization, applicable for picture generation on units with a prespecified finite set of gray levels. Only simple calculations were found to be necessary for affecting the accuracy. A data compression scheme based on the same idea is discussed, and several pictorial examples are presented.
Author

N74-12897# Research Inst. of National Defence, Stockholm (Sweden).
PART COMPILATION IN HIGH LEVEL LANGUAGES
Jacob Palme Nov. 1971 16 p refs
(FOA-P-C-8306-M3(E5)) Avail: NTIS HC $3.00

When a small modification is made to a large program, then the affected segment only has to be recompiled. High level languages like ALGOL 68, ALGOL W, or SIMULA 67 are used for part compilation in a secure and efficient method.
Author

N74-12898# Research Inst. of National Defence, Stockholm (Sweden).
NORD DATA-71 JUNE 1971 IN STAVANGER [NORDDATA-71 21-23 JUN. 1971 I STAVANGER]
Kerstin Blomquist Feb. 1972 32 p refs In SWEDISH
(FOA-3-C-3694-E5) Avail: NTIS HC $3.75

The subjects dealt with were concerned with handling computers, e.g. numerical methods, computer technology, organization of storage, program languages, processor control

and communication between the operator and the computer.
Author

N74-12899# Research Inst. of National Defence, Stockholm (Sweden).
DISCUSSION AND EQUIPMENT FOR FEEDING IN AND TAKING OUT GRAPHICS FROM COMPUTERS [DISKUSSION AV UTRUSTNING FOER IN- OCH UTMATNING AV BILD TILL DATOR]
Leif Strand and Stig Grambo Jan. 1972 39 p refs In SWEDISH
(FOA-2-C-2516-E1) Avail: NTIS HC $4.00

The availability of a graphic treatment apparatus for input to and output from computers is examined. An idea is given of the relatively limited choice today for the apparatus required and also of the costs of the system examined. The result shows however, that there are possibilities of procuring more effective and qualitatively better methods for dealing with computer graphic handling. Author

N74-12900# Research Inst. of National Defence, Stockholm (Sweden).
SOME COMMENTS ON TRANSFERRING A FORTRAN PROGRAM FROM IBM 360 TO UNIVAC 1108 AT LUNDS COMPUTER CENTRE [NAGRA SYNPUNKTER PA OEVERFOERING AV FORTRAN-PROGRAM FRAN IBM 360 TILL UNIVAC 1108 VID LUNDS DATACENTRAL]
Goeran Fick Feb. 1972 9 p In SWEDISH
(FOA-2-C-2526-E5) Avail: NTIS HC $3.00

Experience gained from the attempt to transfer the simulation packet SPODE from IBM to Univac 1108 computer is described. Author

N74-12901# Mound Lab., Miamisburg, Ohio.
FDSR (ARG1,ARG2): A FOCAL PATCH FOR ACCESS TO THE NUCLEAR DATA 50/50 DATA STORAGE REGISTER
F. X. Haas 30 Jul. 1973 11 p refs
(Contract AT(33-1)-GEN-53)
(MLM-2072) Avail: NTIS HC $4.00

This program will retrieve and deposit data into the data storage register of the nuclear data 50/50 analyzer. Program listings are given for use with FOCAL, 1969, with and without extended functions, and FOCAL 5/69. Author (NSA)

N74-12902# Argonne National Lab., Ill. Accelerator Div.
DMAIN, A GENERALIZED DISK UTILITY PROGRAM
G. A. Concaildi and R. D. George 23 Mar. 1973 6 p Sponsored by AEC
(TID-26367; ANL-GAC/RDG-4) Avail: NTIS HC $3.00

A generalized disk utility program written in FORTRAN for the CDC-924A computer is now available. The program is called DMAIN. Its primary purpose is to make manipulation of disk data sets simple. However, limited tape manipulation is available. A description of the vocabulary needed to execute DMAIN is presented. Author (NSA)

N74-12903# Cambridge Consultants Ltd. (England).
A STUDY ON PROCESSING EQUIPMENT FOR LARGE ARRAYS
Malcolm H. Ross and Bohdan M. Watrasiewicz 28 Jun. 1973 108 p refs
(Contract ESOC-464/72-AR)
(ESRO-CR(P)-306) Avail: NTIS HC $7.50

Alternatives to earth image array processing by general purpose digital computers are presented and explained. The emphasis is on optical processing techniques, although the use of special purpose electronic hardware as auxiliary processors to general purpose computers is also included. In particular, materials for real time optical processing are described, and the principles of digital-optical processing are investigated.
Author (ESRO)

N74-12904# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
BINARY NUMBER MULTIPLICATORS USING COMBINATORIAL NETWORKS [MOLTIPLICATORI DI NUMERI BINARI CON RETI COMBINATORIE]
F. Palutan and R. Terenzi Jun. 1972 25 p refs In ITALIAN
(LPS-72-14) Avail: NTIS HC $3.25

A feasibility study of binary digit multipliers by combinatorial networks is presented. Three types of network are discussed: parallel only, series parallel, and squarers system. Conventional MOS circuit multiplier embodiments are compared with read only memory embodiments. ESRO

N74-12905# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
SIGNAL HARMONIC ANALYSIS SYSTEM USING THE HP 2116 B COMPUTER [SISTEMA PER L'ANALISI ARMONICA DEI SEGNALI CON IL CALCOLATORE HP 2116 B]
Franco Palutan Jul. 1972 74 p refs In ITALIAN
(LPS-72-17) Avail: NTIS HC $5.75

Computer programs for real time harmonic signal analysis as applied to the HP 2116 B computer are described. The BASIC language is used throughout. Topics discussed include sampling, quantization, discrete and fast Fourier transformation algorithm, truncation, and amplitude spectrum recovery by Fourier transformation of the autocorrelation function. The flow charts of the main program and subroutines are presented and technical details of the programs outlined. Experimental results are detailed for the case of signals imbeded in noise with various S/N ratios. The effects of aliasing and the use of hanning windows are discussed. Extensions both in hardware and software of the present system are reviewed. ESRO

N74-12906# Royal Radar Establishment, Malvern (England).
AN IMPLEMENTATION OF FOSTER'S SYNTAX IMPROVING DEVICE FOR THE ICL 4100 COMPUTER
J. T. Webb Mar. 1973 25 p
(RRE-TN-774; BR36160) Avail: NTIS HC $3.25

An implementation of Foster's syntax improving device is described for the ICL 4100 computer. The program, called SEMSID, is written in Algol with NEAT code-segments and is based on an implementation of RRE. The program accepts as input a definition of the syntax specifying the grammar for the input to the required object program and outputs either a complete Algol block, or a set of macros calls, or the data set required by an interpretive syntax analyser. The SEMSID will accept semantic actions and rules in the syntax, and also provides for comprehensive failure handling in the object program. Author

N74-12907# Arizona State Univ., Tempe. Dept. of Mathematics.
SURV SYSTEM: A COLLECTION OF PROGRAMS FOR SURFACE VIEWING
Gregory M. Nielson Aug. 1973 32 p refs
(Contract N00014-72-A-0070-0002; NR Proj. 044-443)
(AD-766800; TR-8) Avail: NTIS CSCL 09/2

SURV is a collection of FORTRAN programs for the manipulation and display of parameteric surfaces. The present implementation uses a Tektronix 4010 graphics display terminal which communicates with a time-shared DEC PDP 10. The programs of SURV call upon a set of FORTRAN programs available through Tektronix called Terminal Control System. Even though the implementation of this system is not limited to the above configuration, this report will deal only with the present implementation. SURV provides the user with the ability to conveniently define and view selected portions of a parametrically defined surface. The command language is simple yet versatile. Defining such items as rotation matrices and viewing windows is made rather simple for the user. Author (GRA)

N74-12908*# Stanford Univ., Calif. Dept. of Computer Science.
AUTOMATIC PROGRAM VERIFICATION 1: A LOGICAL BASIS AND ITS IMPLEMENTATION
Shigeru Igarashi, Ralph L. London, and David C. Luckham May 1973 57 p refs
(Contracts NSR-05-020-500; DAHC15-72-C-0308; ARPA Order 457)
(NASA-CR-136273; AD-767331; STAN-CS-73-365; AIM-200; ISI/RR-73-11) Avail: NTIS HC $5.00 CSCL 09/2

Defining the semantics of programming languages by axioms and rules of inference yields a deduction system within which

proofs may be given that programs satisfy specifications. The deduction system herein is shown to be consistent and also deductive complete with respect to Hoare's system. A subgoaler for the deductive system is described whose input is a significant subset of Pascal Programs plus inductive assertions. The output is a set of verification conditions or lemmas to be proved. Several non-trivial arithmetic and sorting programs have been shown to satisfy specifications by using an interactive theorem prover to automatically generate proofs of the verification conditions. Additional components for a more powerful verification system are under construction. Author (GRA)

N74-12909# Georgia Univ., Athens. Dept. of Statistics and Computer Science.
AN INTERACTIVE ANALYSIS OF COVARIANCE UNIT
Mary E. Nash and Rolf E. Bargmann Jul. 1973 171 p refs (Contract N00014-69-A-0423; Proj. Themis)
(AD-767604; THEMIS-UGA-25; TR-95) Avail: NTIS CSCL 09/2

The report contains description and program documentations of a conversational unit for analysis of covariance of data in regular or irregular two-way classification designs. The main part of this report on the basis of detailed illustrations. It describes the question-and-answer frames on a Graphics (IBM 2250) console. The user need not be familiar with programming or with computational details of analysis of covariance. He receives instructions for description of his data from graphically displayed questions. First, an analysis of variance is performed on the response variable. Means, adjusted means, and the analysis of variance table are reported. The user may edit data or see the data plotted before continuing the analysis. After the analysis of covariance, means and adjusted means of the response residuals are reported. The error matrix, correlations matrix, partial regression coefficients, and the analysis of covariance table are displayed. Again, the user may edit data or see plots (now including a regression line or curve). He may perform a new analysis of covariance for various subsets of the concomitant variables. Listings of the FORTRAN programs are contained in the appendix. Author (GRA)

N74-12910# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
NUMERICAL AND DATA ANALYSIS TECHNIQUES APPLIED TO SCIENTIFIC RESEARCH Final Report, 1 Jan. 1970 - 31 Dec. 1972
Joseph E. Martine and Leo F. Power, Jr. 31 Jan. 1973 189 p refs
(Contract F19628-70-C-0120)
(AD-767607; AFCRL-TR-73-0433) Avail: NTIS CSCL 09/2

Described are some selected data analysis, numerical analysis, and computer programming problems ranging from a new method for evaluating integral equations where the integrand is not well behaved to a detailed study of the techniques of exponential curve fitting. Also included are some problems requiring straight-forward data analysis. Each problem selected is presented in capsule form and the analysis and programming techniques leading to a solution are outlined. It should be noted that some of these problems are still being analyzed because of their complexity and continuing character. Author

N74-12911# Naval Postgraduate School, Monterey, Calif.
ALL APPLICATION DIGITAL COMPUTER: COURSE NOTES Technical Report, 1972 - 1973
Gordon H. Syms Mar. 1973 420 p refs
(AD-767327; NPS-53ZZ73031A) Avail: NTIS CSCL 09/2

The report is a set of course notes, or text, on the proposed Navy All Application Digital Computer. The AADC, as it is called, is a programmer-oriented, general purpose, modular digital computer that was originally designed to meet all the 1975-1985 Naval airborne data processing requirements, but it has now had its role generalized to include All Applications. Since the AADC combines many of the most advanced computer hardware concepts now under development in the United States, the study of AADC should be of general interest. The all application role includes real-time and time-sharing computations, and special applications such as line concentrators, super modems, data channels and aircraft electric power controllers. This report includes a chapter on each of the following: a general introduction and summary of all chapters, AADC architectures, all application role, hardware technology, Data Processor Element, Master Executive Control, Signal Processing Element, evaluating AADC developments, High Order Language, and AADC applications. (Modified author abstract) GRA

N74-13679 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT TRENDS OF DIGITAL DATA STORAGE
N. Fichtner *In its* Transl. on Eastern Europe: Sci. Affairs, No. 368 (JPRS-60596) 20 Nov. 1973 p 25-32 Transl. into ENGLISH from Die Technik (East Ger.), Aug. 1973 p 522-525 (For availability see N74-13678 04-34)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-12912* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AUTOMATIC VEHICLE LOCATION SYSTEM Patent
George R. Hansen, inventor (to NASA) Issued 13 Nov. 1973 10 p Filed 5 Oct. 1971 Supersedes N73-10248 (11 - 01, p 0032) Sponsored by NASA
(NASA-Case-NPO-11850-1; US-Patent-3,772,691;
US-Patent-Appl-SN-186700; US-Patent-Class-343-6.5SS;
US-Patent-Class-343-6.5R; US-Patent-Class-343-18B) Avail: US Patent Office CSCL 09E

An automatic vehicle detection system is disclosed, in which each vehicle whose location is to be detected carries active means which interact with passive elements at each location to be identified. The passive elements comprise a plurality of passive loops arranged in a sequence along the travel direction. Each of the loops is tuned to a chosen frequency so that the sequence of the frequencies defines the location code. As the vehicle traverses the sequence of the loops as it passes over each loop, signals only at the frequency of the loop being passed over are coupled from a vehicle transmitter to a vehicle receiver. The frequencies of the received signals in the receiver produce outputs which together represent a code of the traversed location. The code location is defined by a painted pattern which reflects light to a vehicle carried detector whose output is used to derive the code defined by the pattern.
Official Gazette of the U.S. Patent Office

N74-12913* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH POWERED ARC ELECTRODES Patent
Jesse H. Hall, Clarence C. Gettelman, John L. Pollack, Gary C. Goldman, and Arthur J. Decker, inventors (to NASA) Issued 4 Dec. 1973 8 p Filed 14 May 1971 Supersedes N71-34210 (09 - 21, p 3402)
(NASA-Case-LEW-11162-1; US-Patent-3,777,200;
US-Patent-Appl-SN-143508; US-Patent-Class-313-32;
US-Patent-Class-313-153; US-Patent-Class-313-209;
US-Patent-Class-313-217; US-Patent-Class-313-224) Avail: US Patent Office CSCL 09E

Nonconsumable metal electric arc electrodes are described capable of being operated in a variety of gases at various pressures, current, and powers. The cathode has a circular annulus tip to spread the emission area for improved cooling.
Official Gazette of the U.S. Patent Office

N74-12914 Kentucky Univ., Lexington.
METHODS OF ANALYSIS OF LINEAR INDUCTION MOTORS Ph.D. Thesis
Lisandro DelCid, Jr. 1973 152 p
Avail: Univ. Microfilms Order No. 73-20584

The performance characteristics of linear induction motors are analyzed taking into account entry and exit edge effects. Some of the inadequacies of previous studies are eliminated by assuming realistic boundary conditions. In addition, the performance characteristics of the machine are improved by compensating

for undesirable effects; field quantities are related to machine terminal characteristics; an equivalent circuit for a single sided linear induction motor with edge effects is derived; the validity of the proposed mathematical models and approximations are verified experimentally. Dissert. Abstr.

N74-12915 British Library Lending Div., Boston Spa (England).
A DYNAMIC QUALITY FACTOR FOR TRANSISTORS
P. Baumann 10 Oct. 1973 11 p refs Transl. into ENGLISH from Nachrichtentech. Elektron., v. 22, no. 8, 1972 p 269-271
(BLL-PO-Trans-2978-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The maximum stable power gain serves as a dynamic quality factor, and is used for the evaluation of bipolar and unipolar transistors, and also for electron tubes. This quality factor is shown to be more conclusive than other component characteristics for applications such as the use of planar transistors for non-neutralized i.f. stages. The complex slope can be calculated down to the VHF range if, in field effect transistors, this quality factor is known at a relativeiy low frequency vis-a-vis the i.f. slope. Author

N74-12916 British Library Lending Div., Boston Spa (England).
OPTIMIZATION OF THE SUPPORTING STRUCTURES OF PARABOLIC AERIALS
H. Eschenauer and P. Brandt 10 Oct. 1973 29 p refs Transl. into ENGLISH from Tech. Mitt. Krupp, Forschungsber. (Essen), v. 30, no. 2, 1972 p 101-114
(BLL-RDL-Trans-3014-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

In recent years, large parabolic aerials used for satellite communications and in radio astronomy have increasingly gained in importance. Their supporting structures have to meet specific requirements in dimensional accuracy, depending on the purpose for which the aerials are intended. In radio astronomy, these requirements will be very exacting to permit observations in the millimeter wave range. The methods used in the design of such supporting structures are briefly described and examples are quoted to show that optimization of the supporting structures permits reflector deformation due to system loads (e.g. deadweight) to be minimized. The measures taken to optimize a lattice structure and a self-supporting shell are discussed.
Author

N74-12917 British Library Lending Div., Boston Spa (England).
STABLE LOW VOLTAGE ELECTROLUMINESCENT CAPACITORS
V. V. Vargin, F. M. Pekerman, A. L. Lipin, and E. P. Khodikel Oct. 1972 7 p refs Transl. into ENGLISH from Svetotekhnika (Moscow), no. 2, 1972 p 5-7
(BLL-RTS-8538) Avail: British Library Lending Div., Boston Spa, Engl.: £0.60; 5 BLL photocopy coupons

A two-layer vitriform dielectric electroluminescent capacitor is described. It consists of a steel plate (first electrode) to which a layer of enamel with high dielectric constant is applied. On the layer of enamel, a second layer of borosilicate glass with electroluminophore is applied. The second electrode is a transparent conducting film of SnO2. It is shown that the stability of these capacitors is not adversely affected by increasing the frequency above 1000 c/s. Author

N74-12918 New York State Univ., Albany.
PHOTON INDUCED CURRENT AND POTENIAL CHANGES IN FIELD EFFECT TRANSISTORS Ph.D. Thesis
William Glover Seeley 1972 154 p
Avail: Univ. Microfilms Order No. 73-19700

The current-voltage characteristics of an illuminated junction FET are analyzed for a homogeneous illumination generating electron hole pairs along the entire length of the gate junction, and illumination of a narrow strip extending across the channel. With increasing illumination intensity, a cut-off phenomenon of source or drain photocurrents vs. light intensity occurs, due to the back flow of photocurrents across a forward biased section of the gate junction. At sufficiently strong homogeneous illumination, an internal junction region acquires a forward bias voltage, such that the resulting gate junction leakage current compensates the primary junction photocurrent. This region spreads toward source and drain with increasing illumination intensity, resulting in source and drain currents which increase in proportion to the square root of light intensity. Dissert. Abstr.

N74-12919 Missouri Univ., Columbia.
ELECTRICAL CHARACTERISTICS OF THERMISTORS AND CONTACTS AT LOW TEMPERATURES Ph.D. Thesis
Ralph Sherman Barr 1972 194 p
Avail: Univ. Microfilms Order No. 73-21392

Electrical characteristics of manganese and nickel oxides thermistors and tin-oxide-tin devices at 300 K, 80 K, and 4.2 K and below were studied and theoretically analyzed. The V-I characteristics for dc and 60 Hz signals at 300 K, 80 K, and 4.2 K and below were measured and analyzed. A capacitance property at 80 K was observed in all thermistor types studied. Based on the experimental results, a theoretical model representing these devices is proposed. The model at 80 K is based on metal-semiconductor interface capacitance theory in the form of a three layer device. The model is shown to predict all observed results and is shown to be a very useful tool in determining design parameters for given thermistor characteristics. An apparent negative capacitance property was observed in disk thermistors at 4.2 K and below. Dissert. Abstr.

N74-12920*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CONICAL QUADREFLEX ANTENNA ANALYTICAL STUDY
Paul W. Cramer, Jr. 15 Dec. 1973 10 p refs
(Contract NAS7-100)
(NASA-CR-136279; JPL-TR-32-1591) Avail: NTIS HC $3.00 CSCL 17B

A method for evaluating the performance of a four-reflection or quadreflex antenna is reported. Geometrical optics was used initially to determine the ideal feed pattern required to produce uniform illumination on the aperture of the conical reflector and the reverse problem of quickly finding the aperture illumination given an arbitrary feed pattern. The knowledge of the aperture illumination makes it possible to compute the antenna efficiency, which is useful for comparing antenna performance during tradeoff studies. Scattering calculations, using physical optics techniques, were then used to more accurately determine the performance of a specific design. Author

N74-12921# Research Inst. of National Defence, Stockholm (Sweden).
ROTATIONALLY SYMMETRIC AIR CORED SOLENOIDS WITH HOMOGENOUS AND POWERFUL MAGNETIC FIELDS [ROTATIONSSYMMETRISKA LUFTKAERNESPOLAR MED HOMOGENA OCH STARKA MAGNETFAELT]
Evald VonZeipel Nov. 1971 219 p refs In SWEDISH
(FOA-2-C-2496-A2/E4) Avail: NTIS HC $13.00

The field strength at arbitrary points inside solenoids of large winding cross section is described in an analytical dimensionless form as a converging series of single spherical functions with the loci coordinates as variables. The coefficients are developed in series with the solenoid thickness as variable and an additional cross section characteristic as parameter. Helmholtz solenoids with large cross sections have been dealt with. Some of the experimental solenoids types have not been described before, namely solenoids with conical ends bounded by two concentric spheres and provided with equatorial air cores, also solenoids with conical ends, two concentric cylinders and with one or three equatorial air cores. Cylindrical solenoids with air cores have been treated by means of integral theories for Legendre polynomials. The dimensionless analytical representation theory of field strength and homogeneity facilitates direct objective comparisons between the different types of coils. Detailed calculations for each solenoid described are facilitated by tables.
Author

N74-12922# Research Inst. of National Defence, Stockholm (Sweden).
AMPLIFIER FOR CMT-IR DETECTOR MOSAIC [FOERFOERSTAERKARE TILL CMT IR-DETEKTORMOSAIK]
H. O. Lindstrand Oct. 1971 6 p In SWEDISH
(FOA-2-C-2492-E1) Avail: NTIS HC $3.00

A low resistance, low noise amplifier was constructed. From the point of view of performance and complexity, it is suitable for low resistance mosaic detectors especially CMT. The amplifier has an equivalent noise emf at the input of 1.7 nVHz to the minus 1/2 power. It has an amplification of 10000 times within the 0 to 30000 Hz band. Author

N74-12923# Research Inst. of National Defence, Stockholm (Sweden).
CHASSIS CONSTRUCTION FOR AN ANTENNA ARRAY MODULE [CHASSIKONSTRUKTION FOER GRUPPANTENNMODUL]
Lennart Wahlqvist Sep. 1971 25 p In SWEDISH
(FOA-3-C-3683-E2) Avail: NTIS HC $3.25

The mechanical construction and production of chassis are reported with associated details for an antenna array module. Also described are problems encountered during development and their solutions concerning methods of soldering, cooling components (especially connectors), substrate mounting and tension on the wires. A special reference is made of available service points with adaptation of ferrite ceramic material as well as pattern and negative production. Author

N74-12924# Research Inst. of National Defence, Stockholm (Sweden).
TESTS ON A FSK CONVERTER [PROV MED EN FSK-KONVERTER]
Nils Berggren Feb. 1972 57 p refs In SWEDISH
(FOA-3-A-3755-E2) Avail: NTIS HC $5.00

A FSK converter has been developed for a multichannel FSK system. The report deals essentially with the requirements of the new converter during a shorter trial period. An appendix provides technical descriptions of the new construction. Author

N74-12925# Research Inst. of National Defence, Stockholm (Sweden).
INTRODUCTORY EXPERIMENTS WITH THE JOSEPHSON EFFECT [INLEDANDE FOERSOEK MED JOSEPHSON-EFFEKTEN]
Anders Askman Dec. 1971 22 p refs In SWEDISH
(FOA-3-A-3756-E1/E2) Avail: NTIS HC $3.25

A potential standard which employs the Josephson effect offers substantial advantages. It becomes insensitive to climatic factors such as pressure, temperature and humidity and is not qualitatively influenced by material properties. The most striking advantage is that the potential is directly proportional to the frequency of an imposed microwave field according to the equation 2eV = hf. Described are introductory experiments with Josephson's direct and alternating current effects aimed to produce a standard for electromotive power. With access to existing atom clocks it is possible with this standard, to measure electromotive power with a far higher grade of accuracy. Author

N74-12926# Research Inst. of National Defence, Stockholm (Sweden).
ANTENNA ELEMENT FOR AN ANTENNA ARRAY MODULE [ANTENNELEMENT FOR GRUPPANTENNMODULE]
Jorgen Loren Sep. 1971 13 p In SWEDISH
(FOA-3-C-3686-E2) Avail: NTIS HC $3.00

Some alternative transitions between micro-strip lines and circular dielectric filled wave guides are discussed. This wave guide should function as an elemental radiator in an antenna array for 9 GHz. The characteristics of the antenna's radiation pattern are not considered. Author

N74-12927# Research Inst. of National Defence, Stockholm (Sweden).
CIRCUIT AND WIRING COMPONENTS FOR THE RECEIVER PART OF AN ANTENNA ARRAY MODULE [KRETS- OCH LEDNINGSKOMPONENTER FOER MOTTAGARDEL AV GRUPPANTENNMODUL]
L.-D. Wernlund Sep. 1971 18 p In SWEDISH
(FOA-3-C-3687-E2) Avail: NTIS HC $3.00

Production of an initial protoype for an antenna array module is reported that contains components for microstrip in the microwave and receiver parts. Described is the PIN-diode switch with one and two diodes which give 30 and 47 db maximum isolation, respectively. In the case of the balanced arrangement a 3 db directional coupler with 10% bandwidth has also been achieved. In conclusion, a reference is made to attenuators, terminations, connectors and low frequency amplifiers. Author

N74-12928# Research Inst. of National Defence, Stockholm (Sweden).
CALCULATIONS OF AN INTEGRATED FREQUENCY MULTIPLIER FOR AN ANTENNA ARRAY [BERAEKNING AV INTEGRERAD FREKVENSMULTIPLIKATOR FOER GRUPPANTENNMODUL]
Peter U. Tamm Nov. 1971 30 p refs In SWEDISH; ENGLISH summary
(FOA-3-C-3696-E2) Avail: NTIS HC $3.50

The theoretical optimization and basic realization of a three stage frequency multiplier with integrated microwave circuits are considered. It is for use in a phased antenna array designed to give 1 W CW at 9 GHz with an overall efficiency of about 5%. A preliminary circuit construction has been tested which however, did not fulfill the above requirements. A discussion on the reasons for this is included some of the special problems with integrated microwave circuits are outlined. Author

N74-12929# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. of Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
EXTREME UV STUDY OF THE CHANNELTRON SENSITIVE AREA UNIFORMITY [STUDIO DELL'UNIFORMITA' DELL'AREA SENSIBILE DI CHANNELTRON NELL'ULTRAVIOLETTO ESTREMO]
F. Bordoni and P. Saraceno Mar. 1972 23 p In ITALIAN
(LPS-72-6) Avail: NTIS HC $3.25

Tests were performed on various CEM 4028 multipliers and one CEM 4013. The electronics and experimental set up are detailed. It was found that: (1) the channeltron efficiency is independent of the photon impact point on the cone-shaped mouth of the device, (2) efficiency variations are attributable to inhomogeneities in the surface coating, and (3) the gain exhibits a clear correlation with the photon impact point, with a marked dip at the channeltron center that may reach a total variation of up to 30% between edge and center. ESRO

N74-12930# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
ACTIVE AND PASSIVE COMPONENT QUALIFICATION PROGRAMS AND TESTS [PROGRAMMI E PROVE DI QUALIFICIA PER COMPONENTI ATTIVI E PASSIVE]
C. Bonifazi and G. Paparo May 1972 79 p refs In ITALIAN
(LPS-72-9) Avail: NTIS HC $6.00

Qualification programs and tests for active and passive electronic components are presented. The concept of reliability is discussed together with confidence levels and lifetime for a complex electronic system. The content of qualification and selection tests for FET, Zener diodes, ceramic capacitors, and resistors is given. Selection procedures for each component category are detailed and include results of initial measurements, parameter measurements, lifetime at high temperature, thermal cycling, constant acceleration tests, burn-in, X-ray inspection, final measurements, and screening. ESRO

N74-12931# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
CHANNELTRON CONTINUOUS ELECTRON MULTIPLIER CHARACTERISTICS [CARATTERISTICHE DEI MOLTIPLICATORI CONTINUI DI ELETTRONI CHANNELTRON]
Franco Bordoni Jun. 1972 49 p refs In ITALIAN
(LPS-72-11) Avail: NTIS HC $4.00

The physical properties of straight and curved channeltrons are presented. Topics discussed are the dependence of the gain as a function of the length to diameter ratio and the coating properties, ionic saturation, space charge, electric field distortion, pulse height distribution, service life, clean up mode, efficiency for protons and electrons and photons. Applications to image intensifiers and XUV detectors are emphasized. Most experimental results presented in the form of graphs are taken from the literature. ESRO

N74-12932# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
ANALOG NOISE GENERATORS WITH UNIFORM PROBABILITY DENSITY [GENERATORI ANALOGICI DI RUMORE A DENSITA' DI PROBABILITA' UNIFORME]
A. Anav, C. Bonifazi, and R. Orfei Jun. 1972 68 p refs In ITALIAN
(LPS-72-13) Avail: NTIS HC $5.50

The realization of analog noise generator circuits with uniform probability density for application to analog-stochastic converters is presented. Two embodiments are proposed. The first uses time invariant systems without memory transforming a Gaussian noise into a uniform noise. Diode function generators are used as a consequence of a mathematical treatment of the problem which emphasizes the role played by the error function and its approximation by linear segments. Experimental results are discussed. The second embodiment includes a memory element in the circuit which basically converts into a random signal any deterministic input signal leaving invariant the probability distribution. The experimental results are detailed with special regard to the amplitude distribution and spectral analysis of the input and output signals. The proposed circuit is shown to yield a stochastic process with uniform probability density (for triangular input signals) up to a frequency of 50 KHz. ESRO

N74-12933# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
HIGH EFFICIENCY OSCILLATOR WITH AMPLITUDE CONTROL OVER A LARGE DYNAMIC RANGE [OSCILLATORE AD ALTO RENDIMENTO CONTROLLABILE IN AMPIEZZA SU UNA AMPIA DINAMICA]
P. Bonifazi, S. Cantarano, and G. V. Pallottino Nov. 1972 58 p refs In ITALIAN
(LPS-72-25) Avail: NTIS HC $5.00

A dc to dc voltage converter for the SIRIO satellite experiment on trapped radiation electrostatic deflector is presented. The converter is to allow for a programmable bipolar tension between a few volts and a few KV. Other boundary conditions are: low power dissipation and high output voltage stability. The circuit is of the symmetrical type with two active elements operating in class A, B, or C depending on the polarization state of the control grids. To this effect the feedback link is provided by RC networks. The theoretical calculations of the oscillator are detailed and the experimental results from a breadboard model are in good agreement. A computer simulation was used to choose the free parameters and specify the final project design. The static and dynamic characterizations are discussed. ESRO

N74-12934# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
MEASUREMENTS ON AN A/D LOGARITHMIC CONVERTER WITH CAPACITIVE DISCHARGE [ALCUNE MISURE SU UN CONVERTITORE A/D LOGARITMICO A SCARICA CAPACITIVA]
S. Cantarano, G. V. Pallottino, and G. Paparo Jan. 1973 22 p refs In ITALIAN
(LPS-73-1) Avail: NTIS HC $3.25

An A/D logarithmic converter with capacitive discharge is presented emphasizing simplicity, precision, and dynamic ranges. The memory capacitor, the influence of the FET transistor switch, and the RC temporization circuit are detailed. An error analysis was performed; the results of which were confirmed by experimental tests. Nonlinearities in the time/voltage diagram due to dielectric absorption were shown to be improved when using polystyrene or polycarbonate capacitors. The total error is one percent over a dynamic range of two to three decades. Applications to IMP-H satellite are outlined. ESRO

N74-12935# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
FLIGHT AND GROUND ELECTRONICS FOR THE XUV ROCKET EXPERIMENT
C. Bonifazi and G. V. Pallottino Aug. 1973 41 p refs
(LPS-73-19) Avail: NTIS HC $4.25

The electronic equipment for the XUV experiment launched by a Nike-Tomahawk sounding rocket during the solar eclipse of June 30, 1973, as well as the ground-based equipment, are described. The instrument is a modified version of a spectrometer based on a diffraction grating. The equipment consists of six detectors, each one provided with a narrow band filter, of which the nominal wavelength was established to measure the following lines of the XUV spectrum: 30.4, 58.4, 92.0, 102.6 mm. The experiment was successfully launched, and the preliminary data have shown its correct operation in spite of strong heating of the payload. ESRO

N74-12936# Control Data Corp., Minneapolis, Minn.
PLASMA DISPLAY COLOR TECHNIQUES USING TUBULAR CONSTRUCTION Final Report, Jan. 1972 - Mar. 1973
Clark Bergman Griffiss AFB, N. Y. RADC Jul. 1973 49 p refs
(Contract F30602-72-C-0167)
(AD-766933; DSD-1122; RADC-TR-73-188) Avail: NTIS CSCL 09/5

The results of a program which established the feasibility of achieving multicolor capability with plasma panels using tubular-type construction are described. Efficient phosphors have been identified which, when exposed to krypton or xenon discharges, produce the color blue, green, red, and white. These phosphor/gas combinations possess characteristics which are sufficient for bistable plasma display operation. A process has been developed for uniformly coating the inside of discharge tubes with phosphor. Brightness and contrast ratio are more than adequate for most display applications. The preferred phosphors are not significantly damaged during operation. Further work to control outgassing and to establish dynamic operating characteristics is warranted. The prospects for successful development of the multicolor tubular plasma display are very favorable. Author (GRA)

N74-12937# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION ON THE APPLICATION OF THE METHOD OF PARTIAL IMAGES TO A DYNAMIC PROBLEM M.S. Thesis
John Francis Timony Jun. 1973 46 p refs
(AD-767659) Avail: NTIS CSCL 09/1

The method of partial images has been successfully applied to electrostatic problems involving conductors on a dielectric substrate. This same method is investigated for its adaptation to dynamic problems. A Greens function is derived and applied to the problem of a wire dipole antenna on a dielectric substrate. The input admittance of the antenna is computed by the method of moments. Experimentally measured values of input admittance are compared with the theoretical values and the error is discussed. Author (GRA)

N74-12938# Naval Research Lab., Washington, D.C.
SURVEY OF SOLID STATE REFLECTIVE/TRANSMISSIVE DISPLAY MEDIA Final Report
D. L. Mitchell and L. A. Rauber Sep. 1973 36 p refs
(NR Proj. 215-171)
(AD-767644; NRL-MR-2657) Avail: NTIS CSCL 09/5

A survey of basic research was conducted to determine the feasible solid state media candidates for use in high contrast aircraft cockpit displays operating in a reflective or transmissive mode. A model for reflective and transmissive displays was developed in order to relate display performance to physical poperties of the media. Threshold levels were set and candidates screened against these criteria. No solid state candidates passed this screening in all respects. PLZT ceramic plates and alkali halide M-centers were found to be acceptable with reservations and warrant further consideration. Author (GRA)

N74-12939# Radio Corp. of America, Princeton, N.J.
YELLOW LUMINESCENT DIODES Final Report, 1 Jan. 1971 - 31 Dec. 1972
Charles J. Nuese Jan. 1973 96 p refs
(Contract N00014-71-C-0198; NR Proj. 213-095)
(AD-767338; PRRL-73-CR-7) Avail: NTIS CSCL 09/1

The authors review the vapor-phase growth technology used for the preparation of the epitaxial layers, and follow this by a section concerned with alloy homogeneity, one of the more

important papameters for the preparation of high-quality in (1-x)Ga(x)P. The problems associated with lattice mismatch in epitaxial growth is discussed, the three types of epitaxy-substrate structures prepared are described. The p-n junctions prepared on GaAs substrates are described, and it is shown that very high quality light-emitting diodes can be obtained when an In(1-x)Ga(x)P alloy composition that has the same lattice constant as the GaAs substrate is used. The growth of In(1-x)Ga(x)P substrates is treated and the high-resistance problems that were consistently observed for such structures due to a variety of technological complications are described. The results obtained with the three different types of structures are compared, and the features and limitations of each are described.
Author (GRA)

N74-12940# Army Electronics Command, Fort Monmouth, N.J.
REMOVABLE INTERDIGITAL ELECTRODES FOR SURFACE WAVE STUDIES
I. N. Greenberg and F. P. Lipshultz Sep. 1973 13 p refs
(DA Proj. 1S7-62705-A-440)
(AD-767524; ECOM-4155) Avail: NTIS CSCL 14/2

Interdigital electrode structures were fabricated on polished glass plaques. By placing the plaques next to the surface of a piezoelectric material and exciting the electrode of the transmitting plaque with pulsed RF energy of the appropriate frequency, good acoustic surface waves are received at a similar plaque at the opposite end of the sample. The plaque electrodes are fragile but reusable if handled with care. Author (GRA)

N74-12941# Dayton Univ. Research Inst., Ohio.
AN INEXPENSIVE UNIVERSAL STEPPING MOTOR CONTROLLER Final Report, Feb. - Jun. 1972
Dennis E. Wisnosky and James S. Solomon Jul. 1973 29 p refs
(Contract F33615-72-C-1372)
(AD-767631; AFML-TR-73-169) Avail: NTIS CSCL 09/3

Many instruments for scientific research and development employ one or more motors for control of some function, or to position, shafts, gratings, mirrors, recorders, etc. Use of this factor provides one of the most simple and economical methods of automating this equipment. The report describes a universal stepping motor controller that is extremely versatile and can be built inexpensively. Control is provided to run the motor in either forward or reverse directions in single steps, or slew at one of eight set rates. Given a number of steps and number of intervals which are multiple of the step size, it may be set to scan automatically under external control or manually. Complete circuit operations and construction details are provided as are some example applications. Author (GRA)

N74-12942# Stanford Univ., Calif. Microwave Lab.
SURFACE WAVE PARAMETRIC PROCESSORS AND LONG DELAY LINES Final Report, 1 Mar. 1971 - 31 Mar. 1973
M. Chodorow, H. J. Shaw, G. S. Kino, D. K. Winslow, and W. L. Bond Jul. 1973 76 p refs
(Contract DAAB07-71-C-0145)
(AD-767549; ML-2180; ECOM-0145-F-71) Avail: NTIS CSCL 09/1

The program is concerned with very long time delays, variable parametric processing and, toward the end, initial calculations and projections concerning the feasibility of integrating large bandwidths into the long delay lines which have been developed. Section II describes thin-film waveguides for surface acoustic waves, of electric-field and slot types, having very low loss and low dispersion. They are well suited for use on wrap-around type surface wave delay lines. Section III deals with helical forms of wrap-around delay lines which provide passive, non-dispersive two-port operation. The construction of lines for one-half millisec time delays is described. Designs for larger delays are shown to be feasible, and designs for maximizing the amount of data storage per unit of delay line area are shown. Section IV is concerned with parametric signal processing, including cross correlation and pulse compression, covering terminal operating characteristics of surface wave versions of these devices operating at input frequency of 100 MHz. Substantial increase in dynamic range is described. Section V contains initial calculations and predictions with regard to incorporating extreme broadbanding techniques, as applied to interdigital transducers, into very long delay lines. Author (GRA)

N74-12943# Condex Corp., Camden, N.J.
IMPROVED DIELECTRIC GUY CABLE Final Report
Alvin A. Cadwallader Aug. 1973 156 p
(Contract F30602-72-C-0059)
(AD-767613; RADC-TR-73-202) Avail: NTIS

The report describes the evolution, theory, development, manufacture, and test of a new type of high strength, dielectric guy cable for use with Loran C and D type towers and other similar systems requiring reliable guying and catenaries. Designated as Condex Tri-Laminar Cable, it consists of straight tensile member elements, multiple and parallel, which are helically positioned or caged in a circular, linear array confined in thermoplastic structures at a relatively long helical pitch. The composite, caged, tensile member structures are coaxially built-up in separate contrapitch layers to achieve the desired cable strengths. Each caging thermoplastic layer is designed to keep each tensile member isolated from its neighbor to prevent them from abrading each other when the cable is loaded, vibrated, or flexed. By using this design characteristic, it is possible to control the tensile member spacing with precision at any pre-determined angle of pitch. It is possible to design and fabricate cables that are unusually flexible and inherently torque free. Author (GRA)

N74-12944# Rockwell International Corp., Anaheim, Calif. Electronics Group.
FUNDAMENTAL STUDIES OF SEMICONDUCTOR HETEROEPITAXY. PART 3: APPENDICES Final Report, Jun. 1970 - 30 Jun. 1973
Ralph P. Ruth, A. James Hughes, Joseph L. Kenty, Harold M. Mansevit, and Arthur C. Thorsen Aug. 1973 151 p refs
(Contract DAAH01-70-C-1311; ARPA Order 1585)
(AD-767289; C71-86/501-Pt-3) Avail: NTIS CSCL 09/1

Contents: Work functions and surface double layer potentials of monovalent metals from a network model; Anisotropy in electrical properties of (001)Si(0112)Al2O3; Anisotropy in the electrical properties of N-type (221)Si/(1122)Al2O3; Stress induced anisotropy in the electrical properties of Si/Al2O3; Bibliography - electron microscope in situ nucleation and growth studies; Electron scattering by gaseous atoms; Preliminary EM6 modifications for in situ chemical vapor deposition. GRA

N74-12945# Radio Corp. of America, Princeton, N.J.
ELECTROLUMINESCENT DIODE SWITCHES Final Report, 1 Jan. - 31 Dec. 1972
Charles J. Nuese Jan. 1973 71 p refs
(Contract N00014-72-C-0251; NR Proj. 215-172)
(AD-767400; PRRL-73-CR-5) Avail: NTIS CSCL 09/5

GaAs and GaAs(1-x)P(x) p-n-p-n Shockley diode structures have been prepared by an epitaxial vapor-phase growth technique. The two-terminal devices exhibit a negative-resistance I-V characteristic, which allows them to be used as an electroluminescent diode with a built-in latching (memory) capability. The FaAs diodes have breakover voltages between 2 and 3 V at room temperature. After breakdown, they emit near-bandgap infrared radiation with external quantum efficiencies as high as 0.4%. The emission spectra have been found to consist of two peaks, one corresponding to recombination in the innermost n-layer, and the other corresponding to recombination in one of the two p-type layers. The emission for the GaAs diodes occurs uniformly over the entire surface area. A 5-by-7 alphanumeric display was fabricated from the GaAs vapor-grown diodes. These devices are addressed by the superposition of positive and negative pulses to the appropriate rows and columns, respectively. The successful generation of a variety of characters by this technique had demonstrated the feasibility of the Shockley diode concept for display applications. Future technological problems associated with such a display are discussed. (Modified author abstract)
GRA

N74-12946# Cornell Univ., Ithaca, N.Y.
ADVANCED CONCEPTS OF MICROWAVE GENERATION AND CONTROL IN SOLIDS Technical Report, 1 Jan. - 31 Mar. 1973
Griffiss AFB, N. Y. RADC Jul. 1973 113 p refs
(Contract F30602-71-C-0110)

(AD-767225; RADC-TR-73-196) Avail: NTIS CSCL 09/1

Contents: Multi-Mesa TRAPATT fabrication, high frequency high efficiency avalanche oscillators, high frequency Pt-n-p- diodes, BARITT devices, microwave field-effect transistors, amplifier properties, computer experiments on TRAPATT diodes, C. W. high performance TEO, growth and evaluation of InP for LSA oscillations, ion implantation and diffusion, ionization rates in GaAs, vacuum epitaxial growth in silicon, gallium arsenide microwave monolithic integrated circuit study. GRA

N74-12947# Naval Postgraduate School, Monterey, Calif.
AN APPLICATION OF THE PIECEWISE-SINUSOIDAL REACTION MATCHING TECHNIQUE TO LINEAR DIPOLE ANTENNAS M.S. Thesis
Michael Lynn Bryant Jun. 1973 106 p refs
(AD-767654) Avail: NTIS CSCL 09/5

The paper is an application of the Piecewise-Sinusoidal Reaction Matching Technique (PSRMT) to linear, parallel thin-wire dipoles. The method of moments is briefly outlined and the fundamental electromagnetic principles of reciprocity, surface equivalence and reaction are discussed. Through a logical combination of these concepts, PSRMT is developed and applied to thin-wire dipoles radiating in free space due to a delta function voltage generator at their center. The driving point impedance and the current distribution are calculated and compared to results obtained from other independent theoretical techniques. (Modified author abstract) GRA

N74-12948# General Electric Co., Auburn, N.Y. Semiconductor Products Dept.
THE 200 AMPERE GATE CONTROLLED SWITCH Final Technical Report, 1 Jun. 1971 - 30 Apr. 1973
E. Duane Wolley, Frederick M. Matteson, Robert L. Steigerwald, and Rosendo U. Yu Aug. 1973 150 p refs
(Contract F33615-71-C-1729)
(AD-767619; AFAPL-TR-73-39) Avail: NTIS CSCL 09/1

A 200A gate turn-off thyristor was developed along with a device tester, inverter, and circuit breaker. Devices capable of interrupting 200 Amps in 1.0 microsecond with a forced turn-off gain of 5 were obtained. The inverter and circuit breaker use these devices. The theory of operation for both devices and circuits are presented. Fabrication techniques are also presented. Author (GRA)

N74-12949# Information Systems, Menlo Park, Calif.
ANTENNA MODELING PROGRAM, SYSTEMS MANUAL
10 Apr. 1973 291 p refs
(Contract N00014-71-C-0187)
(AD-767420; IS-R-72/10) Avail: NTIS CSCL 09/2

The manual contains a detailed discussion of the FORTRAN coding of the Antenna Modeling Program (AMP). Its purpose is to aid the programmer in understanding the intricacies of the FORTRAN coding, and it is designed as a reference manual so that the programmer can examine the function of one subroutine or common block separately. By the same token the FORTRAN list is an integral part of the manual and should be used in conjunction with reference to the manual. The Antenna Modeling Program is based on the thin wire electric field integral equation which relates the exciting electric field to the induced currents on some specified thin wire geometry. The integral equation is reduced to an N dimensional system of linear equations by representing the current in terms of N sinusoidal basis functions and enforcing the integral equation at N discrete points. GRA

N74-12950# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
AN INVESTIGATION OF Ag-O-Cs PHOTOEMISSIVE SURFACES USING AUGER ELECTRON SPECTROSCOPY
Thomas W. Rusch Aug. 1973 282 p refs
(Contract N00014-68-A-0141-0002)
(AD-767340; TR-73-01) Avail: NTIS CSCL 09/1

An investigation of the relationship between the photoemissive characteristics and the surface elemental compositon of Ag-O-Cs photocathodes was carried out. In support of this investigation it became desirable to examine the validity of the photocathode model proposed by Borziak, Bibik, and Kramerenko with respect to more recently acquired photoelectron energy distribution and Auger electron emission data. The basis for this model is that the Ag-O-Cs photocathode is a composite of metallic silver particles dispersed in a cesium oxide matrix. With this premise, the photoelectric sensitivity in the ultraviolet (lambda < 300 nm) is ascribed to the cesium oxide and that in the visible and infrared (lambda > 300 nm) to the metallic silver particles. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-12951* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTEGRATED CIRCUIT PACKAGE WITH LEAD STRUCTURE AND METHOD OF PREPARING THE SAME Patent
Bobby W. Kennedy, inventor (to NASA) Issued 11 Dec. 1973 6 p Filed 27 Mar. 1972 Supersedes N72-21274 (10-12, p 1590
(NASA-Case-MFS-21374-1; US-Patent-3,778,685; US-Patent-Appl-SN-238047; US-Patent-Class-317-234R; US-Patent-Class-317-234E; US-Patent-Class-317-234F; US-Patent-Class-317-234M; US-Patent-Class-317-234N) Avail: US Patent Office CSCL 09C

A beam-lead integrated circuit package assembly including a beam-lead integrated circuit chip, a lead frame array bonded to projecting fingers of the chip, a rubber potting compound disposed around the chip, and an encapsulating molded plastic is described. The lead frame array is prepared by photographically printing a lead pattern on a base metal sheet, selectively etching to remove metal between leads, and plating with gold. Joining of the chip to the lead frame array is carried out by thermocompression bonding of mating goldplated surfaces. A small amount of silicone rubber is then applied to cover the chip and bonded joints, and the package is encapsulated with epoxy resin, applied by molding. Official Gazette of the U.S. Patent Office

N74-12952 British Library Lending Div., Boston Spa (England).
A COMPUTER PROGRAM FOR THE DESIGN OF GENERAL PARAMETER LC FILTERS
Miklos Herendi 5 Jul. 1973 12 p refs Transl. into ENGLISH from Hiradastech. (Budapest), v. 23, no. 11, 1972 p 338-343 (BLL-RDL-Trans-2974-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The GEPARD program package was developed for the design of lossy general parameter ladder lowpass and bandpass filters. All computations are performed with a transformed frequency variable. The minimum stopband losses may be specified by a stair-like function. The realization process is automatic or can be prescribed by the designer. A lossy bandpass filter design example illustrates the use of the program. Author

N74-12953 British Library Lending Div., Boston Spa (England).
MANUAL CONTROL USING AUDITORY FEEDBACK
Hiroshi Tamura et al Oct. 1973 20 p refs Transl. into ENGLISH from Shisetemu to Seigyo (Japan), v. 16, no. 4, 1972
(BLL-RTS-7830) Avail: British Library Lending Div., Boston Spa, Engl.: £1.90; 6 BLL photocopy coupons

Experimental results are reported about the records and limits of human control when visual feedback is used. These results are compared with the results of control experiments on both vibrational and visual senses. Factors which determine the limit of human control are discussed. A difference in signals given by the display and in the control results is presented along with a comparison of information effectiveness, and a difference in action modes due to that in information. Author

N74-12954# Lockheed Missiles and Space Co., Palo Alto, Calif.
INTRODUCTION TO THE THEORY OF DISCRETE AUTOMATIC SYSTEMS, CHAPTER 4
V. D. Arens, S. M. Fedorov, M. S. Khitrik, and S. V. Luchko

[1973] 51 p Transl. into ENGLISH from the book "Dinamika Sistem Upravleniia Raket s Bortovoi Tsifrovymi Vychislitelnymi Mashinami" Moscow, Mashinostr., 1972 p 63-127
Avail: NTIS HC $4.75; National Translations Center, John Crerar Library, Chicago, Illinois 60616

Lattice functions are described as functions which exist only for discrete equidistant values of the independent variable and are zero between these values of the argument. A lattice function is denoted by the spacing between adjacent discrete values and can be obtained from a continuous function f(t) if t is replaced by nT sub o, i.e., if only discrete values of the function f(t) are considered. It follows that different continuous functions f(t) can correspond to the same lattice function; these continuous functions are called the envelope of the lattice function. Difference equations of lattice functions are solved by z-transform and discrete Laplace transform methods. Example applications in discrete automatic control systems are provided. G.G.

N74-12955# Research Inst. of National Defence, Stockholm (Sweden).
MEASUREMENT OF AM AND FM NOISE IN GUNN AND LAVIN OSCILLATORS [MATNING AV AM OCH FM-BRUSET HOS GUNN OCH LAVINOSCILLATORER]
Torbjoern Lind Oct. 1971 26 p refs In SWEDISH
(FOA-3-C-3682-E8) Avail: NTIS HC $3.50

The signal to noise ratio in microwave oscillators is of great interest. This is especially the case in using Doppler radar whose sensitivity is reduced by noise within the range of 100 kHz from the carrier wave. One simple way of measuring noise is to indicate its effective level in a sideband of given bandwidth relative to the carrier wave level as a function of the frequency displacement from the carrier wave frequency. The effect of the oscillator circuit quality number Qo and Qe on the oscillators AM and FM noise in 1 Hz bandwidth are shown graphically. The signal to noise ratio can be improved both by measures in the oscillator itself and by allowing an external system to influence the oscillator. Author

N74-12956# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTATION OF FLOW IN GRAPHS
Gustaf Borenius Sep. 1971 43 p
(FOA-P-C-8290-M1) Avail: NTIS HC $4.25

The coefficients in the linear mean square estimators for the flow in any arc of a graph are shown to follow Kirchhoff's two laws for the electrical current in networks. This fact can be used for a fast computation of the coefficients. Author

N74-12957# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
STUDY AND REALIZATION OF ULTRA-RAPID LOGIC CIRCUITS IN MIDDLE-SCALE INTEGRATION Ph.D. Thesis - Univ. Sci. et Med. de Grenoble
M. Verhaeghe Jun. 1973 146 p refs In FRENCH
(CEA-R-4396) Avail: AEC Depository Libraries HC $9.50

Middle scale integration is associated with subnanosecond logic in order to realize ultra-rapid logic circuits, characterized by a 40-gate complexity for a dissipation lower than 1 watt. For this purpose, one must find a high special and low power gates family. With use of current mode logic, and sharing of the logic circuit between an internal part and interfaces, mean dissipation can be lowered to 20 mW while mean propagation time is 1 ns by gate. So, circuits present a speed-power product of 20 mW x ns, giving to them one of the best places among the other types of ultrarapid logic. Another interesting aspect of the work is the use of diffused components master slice ineluctng specialized integrated cells, fitting well complex circuits. With this master slice and the different gates, settlement of mean complexity circuits family is foreseen. The elements of this family would be able to reply to the main needs of rapid electronics.
Author (NSA)

N74-12958# Sandia Labs., Albuquerque, N.Mex.
LATCH-UP IN CMOS INTEGRATED CIRCUITS
B. L. Gregory and B. D. Shafer Jul. 1973 21 p refs Presented at 1973 IEEE Conf. on Nucl. and Space Radiation Effects, Logan, Utah, 23-26 Jul. 1973 Sponsored by AEC
(SLA-73-5613; Conf-730703-8) Avail: NTIS HC $3.25

The parasitic transistors and pnpn paths present on junction isolated CMOS circuits have been identified and studied quantitatively. Active SCR structures exist which can be triggered electrically or by a radiation pulse. Detailed studies of SCR paths have been performed on two circuits, the CD4007A and the CD4041A, to relate geometrical and materials parameters to latch-up sensitivity. Both normal bias conditions and bias optimum for obtaining SCR action are employed. Several techniques are proposed to eliminate radiation induced latch-up in future CMOS designs. Author (NSA)

N74-12959# Sandia Labs., Albuquerque, N.Mex.
THRITY-SECOND ANNUAL CONFERENCE ON PHYSICAL ELECTRONICS
1972 62 p Conf. held at Albuquerque, N. Mex., 20-22 Mar. 1972 Sponsored by AEC
(Conf-720349) Avail: NTIS HC $5.25

Abstracts are given of 53 papers that were presented in six sessions, dealing with: electron field emission, adsorption and chemisorption of gases on metals and alloys, desorption, appearance potential spectroscopy, electron emission, surface electronic states, ionization, photoemission, Auger electrons, and semiconductor surfaces and devices. NSA

N74-12960# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
TWO SENSOR MEASUREMENT TECHNIQUE FOR NOISE-LIKE SIGNALS IMBEDDED IN NOISE
A. Anav and G. V. Pallottino Jan. 1972 172 p refs
(LPS-72-1) Avail: NTIS HC $10.75

This technique is applicable to noncoherent, noise-like signals to be measured in the presence of noise. It is based on the use of two different sensors detecting the same signal. The proposed technique and error analysis are detailed. To analyze the implementation of the method, the mathematical models of analog multipliers are discussed. Some devices, used as correlators, are described: variable area multiplier, variable resistance, FET squarer, and function diode squarer. The method was tested using analog computer simulation. A section is devoted to digital correlators with regard to polarity coincidence and semipolarity correlators (with or without compensation and dither). Different implementation are compared and discussed, and application to the power spectrum measurement of the interplanetary magnetic field is detailed. ESRO

N74-12961# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
STUDIES ON OPERATIONAL AMPLIFIERS [ALCUNE CONSIDERAZIONI SUGLI AMPLIFICATORI OPERAZIONALI]
G. V. Pallottino Oct. 1971 92 p refs In ITALIAN
(LPS-71-25) Avail: NTIS HC $6.75

Operational amplifier characteristics and applications is reviewed with regard to integrated circuit embodiment and measurement techniques. The various types of operational amplifier are discussed, and characteristics pertinent to gain and impedance are detailed. The perturbations introduced by real elements are outlined. General problems pertinent to the proper use of operational amplifiers are discussed. The special case of adding circuits and electric filters is detailed. ESRO

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-12962# Technisch Physisch Dienst TNO-TH, Delft (Netherlands).
THE MEASUREMENT OF TRANSLATIONAL ROTATION

ACCELERATORS [HET METEN VAN TRANSLATIE EN ROTATIEVERSNELLINGEN]
J. W. Verheij 14 Jun. 1973 19 p In DUTCH
(Rept-308-105) Avail: NTIS HC $3.00

A modified low voltage parallel measurement method for translational and rotational accelerations is reported. Also described are a new measuring device and its acoustic calibration procedures. Transl. by G.G.

N74-12963# Ohio State Univ., Columbus. Van de Graaff Accelerator Lab.
NUCLEAR PHYSICS RESEARCH WITH A 5.5 MeV VAN DE GRAAFF ACCELERATOR Progress Report, 1 May 1972 - 30 Apr. 1973
Nov. 1973 194 p refs
(Grant NSF GP-10763)
(VDG-009) Avail: NTIS HC $11.75

A brief summary of the on-going research at the Van de Graaff Laboratory is presented. The research reported includes: polarized beam investigations, charged particle radiative capture studies, sub-Coulomb stripping reaction measurement, angular correlation experiments, nuclear lifetime studies, and measurements of total reaction cross sections for nuclear physics. F.O.S.

N74-12964*# Grumman Aerospace Corp., Bethpage, N.Y. Structural Mechanics Section.
SIMULATION CAPABILITY FOR DYNAMICS OF TWO-BODY FLEXIBLE SATELLITES
Fred Austin and George Zetkov 9 Oct. 1973 18 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Mar. 1974
(Contract NAS1-10973)
(NASA-CR-132375) Avail: NTIS HC $3.00 CSCL 14B

An analysis and computer program were prepared to realistically simulate the dynamic behavior of a class of satellites consisting of two end bodies separated by a connecting structure. The shape and mass distribution of the flexible end bodies are arbitrary; the connecting structure is flexible but massless and is capable of deployment and retraction. Fluid flowing in a piping system and rigid moving masses, representing a cargo elevator or crew members, have been modeled. Connecting structure characteristics, control systems, and externally applied loads are modeled in easily replaced subroutines. Subroutines currently available include a telescopic beam-type connecting structure as well as attitude, deployment, spin and wobble control. In addition, a unique mass balance control system was developed to sense and balance mass shifts due to the motion of a cargo elevator. The mass of the cargo may vary through a large range. Numerical results are discussed for various types of runs. Author

N74-12965# California Univ., Livermore. Lawrence Livermore Lab.
POSSIBLE COHERENT ELECTROMAGNETIC EFFECTS IN THE LOS ALAMOS PROTON STORAGE RING
V. K. Neil and R. K. Cooper 4 Jun. 1973 21 p refs
(Contract W-7405-eng-48)
(UCID-16299) Avail: NTIS HC $3.25

A theoretical survey of coherent electromagnetic effects pertaining to the proposed Los Alamos proton storage ring is presented. The effects of the electromagnetic self-forces of the beam on both the incoherent and coherent motion of beam particles are evaluated. The calculations are based for the most part on existing theory. In some instances experimental observations in operating accelerator and storage rings are cited. For the design parameters of the ring, the calculations indicate that only the transverse coherent instability possibly may be troublesome, but may be suppressed by feedback. The design parameters of the ring that are pertinent to this work are shown in tabular form. Author (NSA)

N74-12966# Los Alamos Scientific Lab., N.Mex.
STATUS OF THE LOS ALAMOS MESON PHYSICS FACILITY FOR RADIONUCLIDE PRODUCTION
H. A. Brien, Jr. 1973 19 p refs Presented at a Dedication Symp., Cincinnati, 4 May 1973 Sponsored by AEC
(LA-UR-73-655; Conf-730542-1) Avail: NTIS HC $3.00

The layout of the Los Alamos Meson Physics Facility is given, and, particularly, the Isotope Production Facility is described. Data obtained using the 600-MeV proton synchrocyclotron at the Space Radiation Effects Laboratory on thin target proton-induced spallation cross sections are being used for estimating isotope yields at LAMPF. A sampling of estimated isotope yields is given. NSA

N74-12967# Kanner (Leo) Associates, Redwood City, Calif.
COMPRESSED-AIR ACCELERATION INSTALLATION FOR MODEL PARACHUTES
G. Braun, comp. Jun. 1973 29 p Transl. into ENGLISH of German Res. and Testing Estab. for Aeron. and Astronaut., Inc., Inst. for Flight Mech., Rescue and Salvage Systems Div. Brunswick, report IB-154-73/2 Sponsored by AEC Prepared for Sandia Labs., Albuquerque
(SLA-73-739; IB-154-73/2) Avail: NTIS HC $3.50

The installation, which includes a compressor, breech mechanism, lock, accelerator section, and breaking section with exhaust unit, is described. The parachute system, the transducers, and the telemetry unit are accommodated in the test missile, which is also described. Results of test operations of about one year are briefly discussed. NSA

N74-12968# North Carolina State Univ., Raleigh.
TWO-STAGE LIGHT-GAS GUN INSTALLATION FOR HYPERVELOCITY IMPACT STUDIES Technical Report, 1 Sep. 1967 - 31 Aug. 1973
S. Jeelani, J. J. Kelly, J. K. Whitfield, and R. A. Douglas Sep. 1973 58 p refs
(Contract N00014-68-A-0187; NR Proj. 064-504)
(AD-766810; TR-73-3) Avail: NTIS CSCL 14/2

The report describes a constant base pressure two-stage light-gas gun system installed at North Carolina State University at Raleigh for studying hypervelocity impact phenomena. The gun uses helium gas as propellant and can produce velocities up to 20,000 feet per second. A description of the problems encountered in developing the experimental facility and solutions developed to meet these problems are presented. The components which were designed by the authors include target support, breech support, gas deflector, impact chamber extension, piston and projectile. These components are unique to this installation and have facilitated target alignment, optical measurements and firing the gun. Author (GRA)

N74-12969# Southwest Research Inst., San Antonio, Tex.
REQUIREMENTS FOR EXPLOSION-PROOF ELECTRICAL EQUIPMENT IN AIR FORCE HANGERS Technical Report, Jun. 1971 - Jul. 1972
Lester A. Eggleston and Michael D. Pish Aug. 1973 126 p refs
(Contract F29601-71-C-0116; AF Proj. 683M)
(AD-767600; AFWL-TR-72-135) Avail: NTIS CSCL 01/5

The objective of the research effort was to determine if current requirements for explosion-proof equipment in USAF hangars are more stringent than necessary, and thereby result in unnecessary expense in meeting such requirements. Experiments and tests conducted, both in actual USAF hangars and in the laboratory, indicated that the vapor explosibility hazard from leaks and fuel spills is lower than generally believed. The results of the study indicate that hazardous zone definitions in existing codes could be relaxed without compromising safety. (Modified author abstract) GRA

N74-12970# Utah State Univ., Logan.
MODEL STUDY OF C-5A LANDINGS ON AM2 LANDING MAT Technical Report, 9 Jun. 1971 - 1 Feb. 1973
Fred W. Kiefer, Paul T. Blotter, and Vance T. Christiansen Kirtland AFB, N. Mex. AFWL Aug. 1973 134 p refs
(Contract F29601-71-C-0129; AF Proj. 683M)
(AD-767231; AFWL-TR-72-210) Avail: NTIS CSCL 01/5

After a buckling failure in a section of AM2 landing mat runway during a test landing of a C-5A at Dyess AFB, Texas, in August 1970, a model testing program was initiated. This report presents the results of the development and testing of an analytical model and a 1/7-scale physical model AM2 mat runway subjected to C-5A loadings. The analytical model represents the landing mat as a series of discrete rigid elements interconnected and suspended by springs and dashpots subjected to external forces simulating Coulomb friction, shear, and the

action of the aircraft. Results from the computer program developed included a simulation of the Dyess failure and an evaluation of various mat modifications. The 1/7-scale physical model of the C-5A landing gear produced buckling failures in the model AM2 mat runway similar to the failure that occurred at Dyess AFB. (Modified author abstract) GRA

N74-12971# Advanced Technology Labs., Inc., Westbury, N.Y.
ANALYSIS OF WALL MODIFICATION IN A TRANSONIC WIND TUNNEL
Paolo Baronti, Antonio Ferri, and Thomas Weeks Feb. 1973 55 p refs
(Contract N00014-72-C-0201; AF Proj. 9781)
(AD-767629; ATL-TR-181; AFOSR-73-1900TR) Avail: NTIS CSCL 14/2

A method for transonic wind tunnel corrections based on the concept of measuring streamline deflection and pressure in the vincinity of the tunnel walls, and of analytically determining the streamline deflection that corresponds to the measured pressure and the pressure that corresponds to the measured streamline for external uniform free stream conditions at the same Mach number of the test was experimentally investigated. The method involves the additional step of determining the required wall porosity variation or proper wind tunnel cross sectional areas variation and then making the requisite wind tunnel adjustments to obtain interference free flow. Two, two-dimensional, 6% thick circular-arc airfoils were tested at several angles of attack and at free stream Mach numbers of 0.91 and 0.95 in the AFFDL Tri-Sonic Gasdynamics Facility at Wright-Patterson AFB. Only the portion of the data related to zero angle of attack is analyzed in this report. The analysis provides a verification of the experiments themselves, gives some indication of the characteristics of the tunnel ventilated walls, indicates the sensitivity required of the measurements and defines the wall modifications which are required for interference-free conditions. Author (GRA)

N74-12972# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
A MOTION STUDY OF THE FRANK J. SEILER RESEARCH LABORATORY GUIDANCE TEST FACILITY
Francis A. Crowley and Henry A. Ossing 16 Jul. 1973 24 p refs
(AF Proj. 7628)
(AD-767184; AFCRL-IP-195; AFCRL-TR-73-0417) Avail: NTIS CSCL 14/2

Motion measurements taken at the inertial guidance test facility of the Frank J. Seiler Research Laboratory are applied to problems of facility design and inertial hardware testing. Motion measurements are processed to form unambiguous estimates of platform strain, rotation, and translation to allow a determination of the loop response of the test platform to ground motion and intralaboratory disturbances. In its open loop state, intralaboratory disturbances are found to be dominant source of platform motion, even under quiet conditions. Author (GRA)

N74-13078 Joint Publications Research Service, Arlington, Va.
A LASER SEISMIC STATION
V. M. Klementyev and S. V. Potapyev *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 30-33 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 67-69
(For availability see N74-13074 04-13)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-12973 Tennessee Univ., Knoxville.
THE INTERFEROMETRIC OBSERVATION OF DYNAMIC PARTICLE SIZE, VELOCITY, AND NUMBER DENSITY Ph.D. Thesis
William Michael Farmer 1973 183 p
Avail: Univ. Microfilms Order No. 73-20004

The physical nature of interferometric observations of small dynamic particles was conducted in order to determine possible techniques which simultaneously measure particle size, velocity, and number density. Theoretical equations have been developed to examine various aspects of the problem. Experiments have been performed which verify theoretical predictions. The results present clear evidence that information pertinent to particle size, number density, and velocity can be derived from analysis of the interferometer signal. Dissert. Abstr.

N74-12974 Catholic Univ. of America, Washington, D.C.
CONTRIBUTIONS TO THE STUDY OF THE PHENOMENA OF SELECTIVE WITHDRAWAL AND UPSTREAM INFLUENCE IN STRATIFIED FLOWS Ph.D. Thesis
Shuang Ning Wei 1973 120 p
Avail: Univ. Microfilms Order No. 73-21109

An investigation was made of two phenomena which occur in the flow of a linearly stratified fluid: selective withdrawal from a line sink and upstream influence in front of two-dimensional obstacles. The dynamics of flow establishment were explored in detail. In the sink case, analytic results were also obtained from a linearized theory. The emphasis was on the nature of propagation of disturbances, the development of the flow field and the final steady velocity field. The application of the results to geophysical field problems was also indicated. In the obstacle case, the existence of upstream influence in front of an obstacle was quantitatively documented. It occurred in the form of multiple unattenuated horizontal jets apparently only when there was a separated open wake behind the obstacle. These jets were identified to be the superposition of the same columnar modes found in the sink case. Dissert. Abstr.

N74-12975 Catholic Univ. of America, Washington, D.C.
AN EXPERIMENTAL STUDY ON THE INTERMITTENT PROPERTIES OF THE BOUNDARY LAYER PRESSURE FIELD DURING TRANSITION ON A FLAT PLATE Ph.D. Thesis
Frederick Cragin DeMetz 1973 157 p
Avail: Univ. Microfilms Order No. 73-21731

The flow noise features of the intermittent transition boundary layer on a large flat plate were investigated. Measurements were obtained of the mean flow features of the boundary layer over the flat plate in a mild accelerated flow. Comparisons of these experimental flow parameters with those predicted by numerical solutions to the laminar boundary layer equations indicate that the transition process which occurred on the plate is representative of that which would occur on a smooth rigid flat surface in an acoustically quiet, low turbulence air stream. The temporal and spatial properties of the transition wall pressure field associated with the natural transition process occurring on the plate were obtained as a function of the intermittency factor and compared with those of the fully turbulent pressure field. The results indicate that the fluctuation amplitudes in the intermittent wall pressure bursts of a transition boundary layer are approximately equal to those in the fully turbulent boundary layer region.
Dissert. Abstr.

N74-12976 Carnegie-Mellon Univ., Pittsburgh, Pa.
CONVECTIVE INERTIA EFFECTS IN THE VISCOSEAL Ph.D. Thesis
Riza Alsan Meric 1973 165 p
Avail: Univ. Microfilms Order No. 73-21082

The performance characteristics of viscoseals with helical grooves and finite clearances over the lands are analyzed for laminar flows. A flat plate model of the viscoseal geometry is adopted, and the full Navier-Stokes equations are solved by finite-difference techniques. End effects in the viscoseal are neglected, and the flow in the groove ridge direction is taken to be fully-developed. Thus, the analysis is reduced to a quasi two-dimensional problem. Flow and pressure distributions in the viscoseal are provided for several groove geometries. The maximum pressure generation in the viscoseal with zero axial leakage is found in terms of a sealing coefficient. Because convective inertia and groove side wall effects are accounted for in the analysis the sealing capacity is not independent of Reynolds number and the groove width-to-depth ratio. The power loss which is indicated by a friction coefficient is also found to be a function of the groove width-to-depth ratio. Dissert. Abstr.

N74-12977 California Univ., San Diego.
OBSERVATIONS OF LOW-LYING SUPERFLUID STATES IN A RECTANGULAR ANNULUS Ph.D. Thesis
Donald David Gregory 1973 143 p
Avail: Univ. Microfilms Order No. 73-21192

A sealed, hollow annulus filled with superfluid helium and set into torsion oscillations about its axis was used to determine the critical angular velocity at which energy and momentum are transferred to the fluid. It was used to measure the quantization of the circulation of the superfluid. The feasibility of developing the instrument as a rotation detector was explored. The present system has enough sensitivity as a rotation detector to see the rotation rate of the earth with a signal to noise ratio of one to one. A semiclassical hydrodynamic theory was used to make a theoretical estimate of the critical angular velocities of the different annular containers. These theoretical estimates are within an order of magnitude of the experimental values obtained. Present noise sources are discussed and guide lines for a future apparatus are presented. The direction of further experimental work also is indicated. Dissert. Abstr.

N74-12978 Catholic Univ. of America, Washington, D.C.
EVALUATION OF THE TURBULENT TRANSPORT TERMS FOR A TWO-DIMENSIONAL NOZZLE WALL BOUNDARY LAYER FLOW AT MACH NUMBER FIVE AND WITH PRESSURE GRADIENT, HEAT TRANSFER AND UPSTREAM EFFECTS Ph.D. Thesis
Roland Edward Lee 1973 149 p
Avail: Univ. Microfilms Order No. 73-21738

Expressions for the compressible turbulent flux models for shear flows with pressure gradients, heat transfer, and upstream effects were evaluated. Turbulent shear stress, eddy viscosity, mixing length, turbulent heat-transfer rates, and turbulent Prandtl number distributions were calculated from experimentally measured velocity and temperature profile data, local wall shear stresses, and heat transfer rates. The experimental data were obtained on the NOL boundary layer channel nozzle wall. The results show that the upstream cooling influenced the shear stress, eddy viscosity, and mixing length distributions and not the Prandtl number distribution. Pressure gradients influenced the shear stress distributions as implied by the flow equations but had no detectable effects on the eddy viscosity, mixing length, and turbulent Prandtl number distributions. Dissert. Abstr.

N74-12979 Catholic Univ. of America, Washington, D.C.
AN EXPERIMENTAL AND NUMERICAL STUDY OF WAVE MOTION AND UPSTREAM INFLUENCE IN A STRATIFIED FLUID Ph.D. Thesis
David Albert Hurdis 1973 128 p
Avail: Univ. Microfilms Order No. 73-19864

A system consisting of two superimposed liquid layers of different densities with a thin transition region at the interface is a good laboratory model of an ocean thermocline or of an atmospheric inversion layer. Experiments were performed in a plexiglass channel in which a layer of fresh water on top of a layer of salt solution was used for the flow model. A vertical flat plate, wide in comparison to its height, through the region of varying density and the two-dimensional disturbances thus created were recorded photographically. Velocity profiles were measured in the vicinity of the obstacle, and density profile measurements were made with a conductivity probe before and after each transit of the obstacle. The flow system described was also studied numerically. Dissert. Abstr.

N74-12980 British Library Lending Div., Boston Spa (England).
PRESSURE DROP IN PACKED SPHERES
H. Barthels 5 Jul. 1973 14 p refs Transl. into ENGLISH from Brennstoff-Waerme-Kraft (Duesseldorf), v. 24, no. 6, Jun. 1972 p 233-236 In ENGLISH and GERMAN
(BLL-Windscale-520-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A pressure drop equation is derived for the flow processes in random and regular packed spheres representative of fluidized bed processors. The influence of the porosity and surface roughness are considered. An equation is developed for the pressure drop coefficient which is valid for porosity from 0.26 to 0.48. The influence of the uncertainty in respect to the void volume on the pressure drop is represented quantitatively by an error calculation. Values are given for the porosity in the case of beds of uniform particles as a function of column diameter, the charging method, and the roughness of the spheres. Author

N74-12981 British Library Lending Div., Boston Spa (England).
EQUILIBRIUM THEORY OF BINARY SYSTEMS AS APPLIED TO A FLUIDISED BED AND THE INITIAL RATE OF THE TRANSITION REGION
N. B. Kondukov and M. Kh. Sosna Dec. 1973 17 p refs Transl. into ENGLISH from Khim. Prom. (Leningrad), no. 6, 1965 p 402-406
(BLL-RTS-8560) Avail: British Library Lending Div., Boston Spa, Engl.: £1.60; 5 BLL photocopy coupons

An equilibrium theory of binary systems was applied to a fluidized bed. A numerical analysis of the relationships between the parameters of the system is provided. A binary fluidized bed may also be analyzed with the aid of thermodynamic equipment. The quantitative results of the analysis will depend on the choice of the thermodynamic system and the number of reactions. Graphs are presented to show the correlation of experimental data on all the layers of spherical particles tested in the fluidized bed. Author

N74-12982 Stanford Univ., Calif.
THE TURBULENT BOUNDARY LAYER ON A POROUS PLATE: AN EXPERIMENTAL STUDY OF THE HEAT TRANSFER BEHAVIOR WITH ADVERSE PRESSURE GRADIENTS Ph.D. Thesis
Bennie Francis Blackwell 1973 157 p
Avail: Univ. Microfilms Order No. 73-20463

An experimental investigation of the heat transfer behavior of the near equilibrium transpired turbulent boundary layer with adverse pressure gradient has been carried out. Stanton numbers were measured by an energy balance on electrically heated plates that form the bottom wall of the wind tunnel. Mean temperature profiles were measured by a 0.003 inch diameter thermocouple probe. Two adverse pressure gradients and two types of transpiration boundary conditions were investigated. The concept of an equilibrium thermal boundary layer was introduced. It was found that Stanton number as a function of enthalpy thickness Reynolds number is essentially unaffected by adverse pressure gradient with no transpiration. Shear stress heat flux, and turbulent Prandtl number profiles were computed from mean temperature and velocity profiles. It was concluded that the turbulent Prandtl number is greater than unity in near the wall and decreases continuously to approximately 0.5 at the free stream. Dissert. Abstr.

N74-12983 Colorado State Univ., Fort Collins.
TURBULENT AIR FLOW OVER WIND EXCITED LABORATORY WATER WAVES Ph.D. Thesis
Scott D. Veenhuizen 1973 129 p
Avail: Univ. Microfilms Order No. 73-19894

An experimental study was made of turbulent air flow over water waves in a laboratory wind-water tunnel. Measurements were made with crossed hot-film anemometers of the instantaneous horizontal and vertical velocity components in the air boundary layer above waves generated only by wind and mechanically initiated waves which the wind was allowed to modify. Mean velocity measurements were extended into region below wave crests near the instantaneous water surface with a wave following support mechanism. An organized wave motion corresponding to the water wave was found in the turbulent air flow. This organized motion was apparent in all the spectral quantities computed and was separated from the random turbulence in the air flow with a phase averaging computational technique. The wave induced motion was apparent four to five wave heights above the mean water level and depended primarily upon wave height. Dissert. Abstr.

N74-12984 Catholic Univ. of America, Washington, D.C.
TURBULENCE MEASUREMENTS WITH A LASER DOPPLER VELOCIMETER Ph.D. Thesis
William Joseph Yanta 1973 114 p
Avail: Univ. Microfilms Order No. 73-21641

Turbulence measurements with a laser Doppler velocimeter

(LDV) using the dual scatter or differential Doppler mode were made in a subsonic, fully developed channel flow. The measurements were made using only those light scattering particles occurring naturally in air. Results include mean velocity profiles, turbulence intensities, Reynolds stress distributions, and a skewness measurement of the velocity distribution function across the channel. Statistical techniques were used to obtain the various turbulence parameters. The velocimeter measurements agreed quite well with Pitot and hot-wire measurements. Guidelines were established for the amount of data needed to obtain results with a specified accuracy and confidence level. Measurements were also made to determine the particle size distribution. An aerodynamic means was used to determine the size distribution, in contrast to the usual optical procedures. Dissert. Abstr.

N74-12985 Texas A&M Univ., College Station.
AN ELASTOHYDRODYNAMIC INVESTIGATION OF TIME DEPENDENT PUMPING RING OPERATION Ph.D. Thesis
Lawrence Michael Zull 1973 295 p
Avail: Univ. Microfilms Order No. 73-21716

A theoretical investigation was made of transient operation of a fluid-mechanical device known as a pumping ring. The purpose of this device is to pump small amounts of fluid from a lower to a higher pressure region and to serve as a fluid tight seal between the two regions. The device consists of a thin walled circular ring with an inside radial taper which is fitted on a straight circular cross section. An O-ring seal, located between the housing and the outer surface of the pumping ring, serves as a fluid tight seal separating two regions filled with lubricating oil. The pumping rod executes periodic reciprocating translatory motion. As the rod translates in the pumping direction, large pressures are developed in the fluid film formed by the taper between the pumping ring and the pumping rod. This pressure causes the ring to expand radially, allowing high pressure fluid to be pumped under the ring. On the return stroke of the rod the pumping ring ideally acts as a pressure seal. Dissert. Abstr.

N74-12986 Engineering Sciences Data Unit, London (England).
PERFORMANCE OF CONICAL DIFFUSERS IN INCOMPRESSIBLE FLOW
Oct. 1973 23 p refs Sponsored by Roy. Aeron. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Structural Engr.
(ESDU-73024) Copyright. Avail: Issuing Activity

Data on static-pressure recovery, total pressure loss, and overall flow pattern for incompressible flow through straight axis conical diffusers are presented. The effects of various geometrical and flow parameters on the diffuser performance are discussed. The geometry of a typical diffuser and the associated ducting is illustrated. The three types of flow are defined as: (1) attached flow, (2) transitory separation, and (3) jet flow. Mathematical models are developed to show the relationships between the various parameters. Author

N74-12987 Engineering Sciences Data Unit, London (England).
PRESSURE LOSSES IN THREE-LEG PIPE JUNCTIONS: DIVIDING FLOWS
Oct. 1973 24 p refs Sponsored by Roy. Aeronaut. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Structural Engr.
(ESDU-73022) Copyright. Avail: Issuing Activity

Pressure loss data for dividing flows through planar three leg junctions, all running full, are presented. Data for Y-junctions, angled junction, and generalized junctions are given in nondimensional form and apply to the steady flow of liquids and to the steady flow of gases at Mach numbers not exceeding 0.2. The data apply to junctions where inlet flow is fully developed and where there is a long downstream length. The effects of roughness are included in the losses associated with the upstream and downstream pipe lengths. Mathematical models are developed to show: (1) total pressure loss, (2) static pressure loss, and (3) effect of Reynolds number. Author

N74-12988 Engineering Sciences Data Unit, London (England
PRESSURE LOSSES IN THREE-LEG PIPE JUNCTIONS: COMBINING FLOWS
Oct. 1973 27 p refs Sponsored by Roy Aeronaut. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Structural Engr.
(ESDU-73023) Copyright. Avail: Issuing Activity

Pressure loss data for combining flows through planar three leg junctions, all running full. Data for Y-junctions and angled-junctions are given in nondimensional form and apply to the steady flow of gases at Mach numbers not exceeding 0.2. The data applies to junctions where the inlet flow is fully developed and where there is a long downstream duct length. The effects of roughness are included in the losses associated with the upstream and downstream pipe lengths. Mathematical models are included to show: (1) total pressure loss, (2) static pressure loss, and (3) effect of low Reynolds number. Author

N74-12989# National Engineering Lab., East Kilbride (Scotland). Dept. of Mechanical Engineering.
EXACT SOLUTIONS FOR CONICAL MIXED FLOW ROTORS. PART 2: CAMBERED BLADES OF FINITE THICKNESS
E. H. Fisher and R. I. Lewis Sep. 1972 31 p refs
(NEL-524-Pt-2) Avail: NTIS HC $3.75

The flow characteristics of conical axisymmetric rotors with cambered blades of finite thickness and zero stagger are analyzed. The analysis is performed by transforming the conical rotor successively to a segment of a circle and a single blade. The rotor flow may be obtained by superimposing three separate flows as follows: (1) a displacement flow satisfying the blade surface velocity condition at all points, (2) a blade circulation which satisfies the Kutta condition, and (3) a flow giving the circumferentially averaged inlet conditions. A range of results are compared with the results obtained from a numerical surface singularity program. Author

N74-12990*# Kanner (Leo) Associates, Redwood City, Calif.
THE SEPARATION CONDITION OF BOUNDARY LAYERS
K. Oswatitsch Washington NASA Dec. 1973 17 p refs Transl. into ENGLISH of the "Die Ablosesungsbedingung von Grenzschichten" (West Ger.), 1958 p 357-367 Presented at the Boundary Layer Research Symp., Freiburg, 26-29 Aug. 1957
(Contract NASw-2481)
(NASA-TT-F-15200) Avail: NTIS HC $3.00 CSCL 20D

The conditions under which a three-dimensional flow detaches itself from a wall are investigated. It is assumed that the velocity vector near the wall can be adequately approximated in the vicinity of the separation by means of the beginning of a Taylor series. Applying the continuity equation, Navier-Stokes equations, and the no-slip condition, it is determined that the Taylor coefficients up to second order terms, including the point of separation, can be expressed by components of the wall shearing stress. A system of ordinary differential equations is obtained for the flow lines of a viscous flow near the wall, the solutions of which result in a complete survey of the local separation attitude. Author

N74-12991*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A COMPUTER PROGRAM TO CALCULATE RADIATING VISCOUS STAGNATION STREAMLINE FLOW WITH STRONG BLOWING
G. Louis Smith and L. Bernard Garrett Washington Dec. 1973 82 p refs
(NASA-TM-X-2805; L-8918) Avail: NTIS HC $3.75 CSCL 20D

A computer program (program LEE) has been developed to calculate the fully coupled solution of the radiating viscous stagnation streamline flow with strong blowing. The report describes the digital computer program, including FORTRAN IV listing, flow charts, instructions for the user, and a test case with input and output. Program LEE is available through COSMIC. Author

N74-12992*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER
Robert W. Hornbeck Washington 1973 349 p ref Prepared in cooperation with Carnegie-Mellon Univ.

(NASA-SP-297; LC-74-190300) Avail: NTIS MF $1.45; SOD HC $3.60 CSCL 20D

The finite difference formulation and method of solution is presented for a wide variety of fluid flow problems with associated heat transfer. Only a few direct results from these formulations are given as examples, since the book is intended primarily to serve a discussion of the techniques and as a starting point for further investations; however, the formulations are sufficiently complete that a workable computer program may be written from them. In the appendixes a number of topics are discussed which are of interest with respect to the finite difference equations presented. These include a very rapid method for solving certain sets of linear algebraic equations, a discussion of numerical stability, the inherent error in flow rate for confined flow problems, and a method for obtaining high accuracy with a relatively small number of mesh points. Author

N74-12993# Lockheed Missiles and Space Co., Palo Alto, Calif.

BOUNDARY VALUE PROBLEM OF THE FREE OSCILLATIONS OF A ROTATING IDEAL FLUID

R. V. Rvalov [1973] 9 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 4, 1973 p 81-88

Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The problem of the free oscillations of an ideal incompressible fluid, partially or completely filling a rigid cavity rotating in a field of mass forces, is considered in a linear formulation. The rotation of the fluid cavity system at a constant angular velocity is considered as unperturbed motion. The problem of finding the oscillation frequency spectrum reduces to solving eigenvalue boundary value problems. Particular cavity shapes and modes of rotation are examined for which exact and approximate solutions are obtained for the boundary value problem. Author

N74-12994# National Aerospace Lab., Amsterdam (Netherlands).

THE LAW OF THE WALL IN TWO AND THREE DIMENSIONAL TURBULENT BOUNDARY LAYERS

B. VanDenBerg 1 Mar. 1973 48 p refs

(NLR-TR-72111-U) Avail: NTIS HC $4.50

The law of the wall has been extended to three-dimensional flows. The effects of both the pressure gradient and the inertial forces have been considered. The deduced wall law is valid when the deviations from the simple two-dimensional law of the wall are small. Agreement with measurements is found within the possible experimental error. Author

N74-12995# National Aerospace Lab., Amsterdam (Netherlands).

MEASUREMENTS IN A THREE DIMENSIONAL INCOMPRESSIBLE TURBULENT BOUNDARY LAYER IN AN ADVERSE PRESSURE GRADIENT UNDER INFINITE SWEPT WING CONDITIONS

B. VanDenBerg and A. Elsenaar 15 Aug. 1973 71 p refs

(NLR-TR-72092-U) Avail: NTIS HC $5.75

On a wind tunnel model, especially designed to check calculation methods, measurements were made of a three-dimensional turbulent boundary layer under infinite swept wing conditions in an adverse pressure gradient, with a three-dimensional separation near the trailing edge. Accurate measurements of the external flow field, the mean velocity profiles and the wall shear stresses were carried out. To facilitate the comparison of the experimental data with calculation methods, the external flow field and the initial velocity profile are given in analytical form. Boundary layer profiles at ten measuring stations are given in tables together with the wall shear stress and integral parameters. A momentum balance is also presented indicating that the results are reliable. Author

N74-12996# Aeronautical Research Labs., Melbourne (Australia).

THE EFFECT OF SUDDEN DISCONTINUITES ON TURBULENT BOUNDARY LAYER DEVELOPMENT

W. H. Schofield Mar. 1973 54 p refs

(ARL/ME-Rept-139) Avail: NTIS HC $4.75

The behavior of turbulent boundary layers following a discontinuity in boundary conditions is studied. Emphasis is placed on criteria with which to judge and predict the return of the layer to a state of equilibrium with its new boundary conditions. Experimental results are presented for boundary layer flows in a strong adverse pressure gradient. The discontinuity in boundary conditions was generated by a transition from rough to smooth wall flow. Results are presented as correlations. Interpretation of these correlations show that some assumptions of previous workers require modifications. Author

N74-12997# Technische Hogeschool, Delft (Netherlands).

SECONDARY FLOW IN SIMPLE FLUIDS CAUSED BY SLOW VISCOMETRIC MOTIONS

H. J. Merk Aug. 1973 44 p refs

(WTHD-53) Avail: NTIS HC $4.25

The existence of purely viscometric flows and the definition of primary and secondary flows are discussed. The equations which govern the primary and secondary flows are derived. The concept of simple shearing flow is generalized to cover the so-called viscometric flows, which occur in the experimental apparatus used for measuring rheological properties of nonNewtonian fluids. Examples of the application of flow theory to some flow configurations are provided. Author

N74-12998# Technische Hogeschool, Delft (Netherlands). Lab. voor Aero- en Hydrodynamica.

SLOW STEADY FLOW OF A SECOND ORDER FLUID THROUGH A CONE WITH A SINK/SOURCE AT THE VERTEX

H. J. Merk and J. VanderZangen Aug. 1973 59 p refs Submitted for publication

(WTHD-50) Avail: NTIS HC $5.00

Basic equations for the slow motion of non-Newtonian incompressible fluids are considered. For slow motions the non-Newtonian behaviour of fluids can be represented by simple fluids of second or higher degree, the term of the first degree being the Newtonian term. On this assumption the motion can be decomposed into first, second, and higher order flows. When the first order flow satisfies the boundary conditions, the second order flow appears to be a flow with a vortex nature, confined within finite regions and limited by dividing streamlines. The former is of Stokesian nature and is called the primary flow, while the latter is called the secondary flow. The secondary flow is of special interest because it is more or less characteristics for the non-Newtonian behavior of the fluid and may have a big influence on the operating conditions in technical equipments. Author

N74-12999# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.

SOME PROBLEMS IN THE STUDY OF TURBULENCE TRANSPORT

J. O. Hinze Oct. 1973 26 p refs

(WTHD-54) Avail: NTIS HC $3.25

The problem of turbulent diffusion in a non-homogenous and relation between Lagrangian and Eulerian correlations are studies and the behavior of discrete particles in a turbulent flow is analyzed. Only the diffusion by turbulence is considered and not dispersion caused by non-uniformity of the mean flow. Author

N74-13000# Research Inst. of National Defence, Stockholm (Sweden).

SPEED REGULATION BY FLUIDICS [VARVTALSREGLERING MED FLUIDISTORER]

Peter Hamilton Mar. 1972 14 p In SWEDISH

(FOA-2-C-2532-E4) Avail: NTIS HC $3.00

The construction of multiple stage controllers using fluidic techniques is reviewed. A large number of different subunits have been tested and descriptions of those subunits found to be best are given. Both self controlled regulators and multiple stage units are described. Author

N74-13001# Research Inst. of National Defence, Stockholm (Sweden).

A BOMB STRENGTH METER (BSM) USING FLUIDICS [BSM MED FLUIDISTORER]

H. C. Kierkegaard Oct. 1971 20 p refs In SWEDISH

(FOA-2-C-2493-A1) Avail: NTIS HC $3.00

The possibility of designing a bomb strength meter using fluidics has been investigated. Suitable fluidic circuits for measuring and recording both postive and negative pressure waves when they occur, together with peak values, are described. Suggestions are made for starting gear to put the system in operation (including the power supply) by means of the pressure wave. In conclusion, estimates are made of the development work required and also the cost. The equipment proposed is suitable for resisting the environment, is insensitive to radiation and can be stored in readiness over long periods without attention. Author

N74-13002# Sandia Labs., Livermore, Calif.
DEVELOPMENT AND COMPARISON OF SEVERAL ANALYTICAL MODELS FOR THE PLANAR TURBULENT NEAR WAKE IN SUPERSONIC FLOW COMBINING COMPONENT AND CRITICAL POINT METHODS Ph.D. Thesis - Texas Univ., Austin
J. H. Smith Jul. 1973 146 p refs Sponsored by AEC
(SLA-73-628) Avail: NTIS HC $3.00

The supersonic turbulent base flow problem is solved with integral techniques. The resulting computer code, NRWAKE, performs a complete base flow analysis in 5 to 10 seconds on the CDC 6600. All desired flow parameters are obtained with accuracy by using the Chapman-Korst component analysis to establish all flow parameters in terms of assumed values of base pressure. A final closure is then obtained by using two interpretations of the Crocco-Lees critical point theory to select the correct base pressure along with corresponding parameters of interest. Thus, the determination of correct base pressure is based on strong interaction concepts which link the inner viscous solution to the outer inviscid flow. NSA

N74-13003# McElroy (Ralph) Co., Austin, Tex.
SHOCK WAVE DIFFRACTION AT SHARP CORNERS
Siegmar Schultz Jul. 1973 29 p refs Transl. into ENGLISH from Z. Flugwiss. (Brunswick), v. 20, 1972 p 179-187 Sponsored by AEC Prepared for Los Alamos Sci. Lab.
(LA-TR-73-31) Avail: NTIS HC $3.50

The shape of a diffracted wave is computed semi-empirically. For a diffracting angle of a corner of phi sub omega = -180 deg, the dependency on the shock, Mach number M sub 0 of the undisturbed shock wave is determined theoretically, whereas the dependence on the variable angle phi is determined by a few experiments. This result is enlarged for any diffracting angle phi sub omega by considering the propagation of a perturbation (effected by a change of the diffracting angle, for example) along the diffracted shock front. The agreement between the result of these considerations and experiments proved to be very satisfactory. Author (NSA)

N74-13004# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Dynamik Verduennter Gase.
KINETIC THEORY STUDY OF FREE JET EXPANSIONS IN PRE-SKIMMER CHAMBERS. FREE MOLECULAR FLOW ANALYSIS
P. Raghuraman Porz, West Ger. 1973 65 p refs
(DLR-FB-73-50; AVA-FB-7303) Avail: NTIS HC $5.25; DFVLR, Porz, West Ger. 20,10 DM

An analytic study was made of the collisionless expansions of free jets in pre-skimmer chambers in the presence of skimming hardware and unpumped residual gases. The free jet was modeled by a sudden freeze spherical surface with an ellipsoidal distribution function. The beam skimming hardware was represented by a cone on an infinite wall. Three classes of molecules could interact with the free jet: the unpumped residual gases and the molecules coming from the skimmer cone wall and the infinite wall, respectively. Numerical calculations were made and it was found that for good skimming of free jet molecules, a long skimmer cone with a small half angle is most optimal. Author (ESRO)

N74-13005# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
INTERNAL HYPERSONIC FLOW Interim Report
T. C. Lin and S. G. Rubin Mar. 1973 35 p refs
(Grant AF-AFOSR-1843-70; AF Proj. 9781)
(AD-767598; PIBAL-73-4; AFOSR-73-1694TR) Avail: NTIS CSCL 20/4

Hypersonic flow in the entrance region of a cylindrical tube is analyzed. Both weak and strong viscous interactions are considered and the differences between internal and external flow with transverse curvature are discussed. For the weak interaction case, only the leading term or inviscid flow is considered. The rotational flow field is determined by a thin-shock-layer method. Comparisons are made with solutions obtained from the equivalence principle as well as with an exact numerical finite-difference integration. In the strong interaction region, the Karman-Polhausen integral method and the tangent-cone approximation are used to describe the boundary-layer flow and the streamwise pressure variation, respectively. The shock-wave location, the induced pressure field, the heat transfer and the displacement thickness are determined. It is found that transverse curvature leads to an adverse pressure gradient effect for internal flows. Author (GRA)

N74-13006# Army Missile Command, Redstone Arsenal, Ala. Aeroballistics Directorate.
THE VISCOUS INTERACTION OF INCOMPRESSIBLE SEPARATED FLOWS
Wen L. Chow and Donald J. Spring 17 Aug. 1973 31 p refs
(DA Proj. 1M2-62303-A-214)
(AD-767236; RD-73-22) Avail: NTIS CSCL 20/4

The two-dimensional incompressible separated flow problem is analyzed by establishing a corresponding inviscid free streamline flow field which can be constructed by the method of conformal mapping. GRA

N74-13007# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
THE INTERACTION OF A HYPERSONIC PLUME WITH AN EXTERNAL HYPERSONIC STREAM
John T. Kelly Jul. 1973 165 p refs
(Contract DAHC04-69-C-0077; ARPA Order 1442)
(AD-767280; PIBAL-73-12) Avail: NTIS CSCL 16/2

A theoretical study of the gas dynamic interaction between a hypersonic plume and the opposed hypersonic external stream is presented. Steady, axisymmetric, inviscid, perfect gas flow is postulated for both the bow and far field regions. Limiting forms of solutions are obtained for the bow region by application of the Newton-Busemann approximation to both the exhaust plume and ambient air flow. Through asymptotic expansions and their matching, it is found that six regions are required to adequately describe the bow region. For the far field region, the hypersonic small-disturbance form of the Newton-Busemann approximation is applied. From asymptotic expansions and their matching, it is found that entropy wake solutions are required to adequately describe the exhaust flow and the air flow near the contact surface. Analytical solutions are obtained which (1) define scaling parameters for the bow and far field flow; (2) estimate the accuracy of the Newtonian impact theory in predicting bow region geometry and properties; (3) establish the variation of bow and far field properties with variation in the primary system design parameters. (Modified author abstract) GRA

N74-13008# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE STABILITY OF A CLOSED BOUNDARY LAYER DETACHMENT DOMAIN IN SUPER- AND HYPERSONIC FLOW
H.-P. Kabelitz [1973] 16 p Transl. into ENGLISH of German Aero- and Astronaut. Soc., Baden-Baden, report 71-065, 11-13 Oct. 1971
(Rept-71-065) Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The stability of a closed boundary layer detachment domain in supersonic and hypersonic flow conditions was investigated. The characteristics of a closed boundary layer separation domain are described. The application of flow separation to aerodynamic braking and aircraft control is discussed. An empirical stability assertion for a closed boundary layer separation domain is developed. Wind tunnel tests were conducted to establish the characteristics of oscillating and pulsating type flows. Author

N74-13009# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
ANALYTICAL STUDY OF SUBSONIC LAMINAR BOUNDARY LAYER SEPARATION AND REATTACHMENT INCLUDING VISCOUS-INVISCID INTERACTION
G. R. Inger and Birendra Dutt May 1973 54 p refs
(Grant AF-AFOSR-2173-72; AF Proj. 9781)
(AD-767602; VPI-E-73-20; AFOSR-73-1686TR) Avail: NTIS CSCL 20/4

An approximate analytical theory is developed for predicting nonsimilar laminar boundary layer flows with separation, reversed flow and reattachment including subsonic viscous-inviscid interaction, with application to a separation bubble problem. The analytical approach is based on a triple-deck flow model, the boundary layer being divided into two layers overlaid by a third region of interacting inviscid flow. It is shown that this model has a heretofore-unrecognized double-branched solution character that enables it to pass through separation and reattachment without signularities and provide a unified description over a wide range of both attached and reversed flow states. An iterative stream-wise pass method of calculation is devised which is free from the usual Crocco-Lees critical points occurring in interaction problems. Application to a specific example involving a linear adverse pressure gradient yields results in good agreement with an exact Navier-Stokes solution. Author (GRA)

N74-13010# Harry Diamond Labs., Washington, D.C.
FLUERICS 35: JET DYNAMICS AND ITS APPLICATION TO THE BEAM-DEFLECTION AMPLIFIER
Joseph M. Kirshner Jul. 1973 41 p refs
(DA Proj. 1T0-61102-A-33B; HDL Proj. 302331)
(AD-767255; HDL-TR-1630) Avail: NTIS CSCL 13/7

The report shows how the response of a jet to a pressure gradient is used to derive the impedance of the jet. The results are used to obtain the transfer function, for the variation of the output pressure with variation of input pressure, for a beam-deflection amplifier, including the effects of the vent and of output loading. The input impedance is shown in general, to depend upon the vent and output impedances. Author (GRA)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-13011* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD FOR OBTAINING OXYGEN FROM LUNAR OR SIMILAR SOIL Patent
William R. Downs, inventor (to NASA) Issued 20 Nov. 1973 5 p Filed 28 Feb. 1972 Supersedes N72-20355 (10 - 11, p 1467)
(NASA-Case-MSC-12408-1; US-Patent-3,773,913; US-Patent-Appl-SN-229916; US-Patent-Class-423-579) Avail: US Patent Office CSCL 03B

Recovery of oxygen from soil containing metal oxides such as alumina, silica, calcia, magnesia, and ilmenite wherein the material containing the oxides is placed in a vessel and reacted with fluorine to provide oxygen and metal fluorides. The oxygen produced from the reaction is recovered and stored, after further purifying processes, and the metal fluorides are further reacted with potassium vapor to provide potassium fluoride and free metals. The potassium fluoride is than subjected to electrolysis whereby the potassium and fluorine are separated and are recycled for further use in the system. Valuable free metals are recovered for other uses. Official Gazette of the U. S. Patent Office

N74-13012 Rice Univ., Houston, Tex.
THE DETECTION OF HIGH FREQUENCY MODULATION IN PRECIPITATING AURORAL ELECTRONS Ph.D. Thesis
Robert Fallis Loewenstein 1973 160 p
Avail: Univ. Microfilms Order No. 73-21571

Theoretical considerations indicate that auroral electrons may become bunched due to wave-particle interactions. A high time resolution experiment designed to detect such bunching was flown above an auroral band of visual intensity of 40 kR on February 24, 1972 at 21:22 LT. The instrument consisted of a hemispherical electrostatic energy analyzer, an electron multiplier, and a spectrum analyzer. The spectrum analyzer swept in frequency from 50 kHz to 10 MHz with a minimum bandwidth of 50 kHz. A 5% modulation of the downcoming flux was observed at 4.2 to 5.6 MHz at T+211 to T+218 seconds in the flight. This time corresponds to the position of the boundary between opposite Birkeland current sheets determined from other onboard experiments. Dissert. Abstr.

N74-13013 Wisconsin Univ., Madison.
CIRCULATION PATTERNS IN LAKE SUPERIOR Ph.D. Thesis
San-Lang Lien 1973 224 p
Avail: Univ. Microfilms Order No. 73-19313

The lake is considered to be homogeneous which is approximated during the fall and spring seasons. The effects of lake geometry (i.e., both horizontal and depth variations), of bottom conditions (i.e., slip or no-slip), and of wind stress distributions on the movement of the water are studied. The water movements studied in Lake Superior are large scale motions; hence, the Coriolis force must be taken into consideration. Theoretical solutions for the circulation patterns are obtained for two-dimensional (vertically integrated) and three-dimensional steady-state conditions and for two-dimensional (vertically integrated) transient conditions. Because of the large scales the Rossby number is small, and the equations of motion can be linearized. Dissert. Abstr.

N74-13014 British Library Lending Div., Boston Spa (England).
ON THE ORIGIN OF SHALLOW TEMPERATURE INVERSIONS UNDER THE HOMOGENEOUS SURFACE LAYER IN THE OCEAN
K. N. Fedorov [1973] 8 p Transl. into ENGLISH from Okeanol. (Moscow), v. 11, no. 1, 1971 p 16-21
(BLL-M-22354-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A temperature inversion in a layer of depth about 10 m under the deep (120 m) homogeneous surface layer was found by the Crawford expedition south of the Lesser ANTILLES. Sliding of warm shelf water, made relatively saline by evaporation, along isopycnic surfaces under the upper homogeneous layer formed in the open ocean at the beginning of winter was the hypothesis put forward to explain the origin of the inversion. Author

N74-13015 British Library Lending Div., Boston Spa (England).
OCEANOGRAPHIC SURVEYS OF THE ORIGNY IN THE STRAIT OF GIBRALTAR. INTERNATIONAL CAMPAIGN 15 MAY - 15 JUNE 1961. PART 2: SURFACE CURRENTS IN THE STRAIT OF GIBRALTAR
Georges Peluchon 30 Nov. 1973 13 p ref Transl. into ENGLISH from Cahiers Ocean., (Paris), v. 14, 1972 p 474-483
No diagrams etc., to be used in conjunction with original paper (BLL-M-20110-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Observations of sea currents in the Strait of Gibralter are presented. Measurements were taken at different levels with mill-type current meters and towed electrode current meters. Measurements were made simultaneously by different ships to check the regime of water exchange between the Mediterranean and the Atlantic through the Strait. K.M.M.

N74-13016 British Library Lending Div., Boston Spa (England).
ON THE STATISTICAL STRUCTURE OF THE BRIGHTNESS FIELD OF REFLECTED RADIATION IN THE 0.6-0.8 MICRON SPECTRAL INTERVAL
V. G. Boldyrev and V. I. Tulupov Nov. 1973 11 p Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr SSSR (USSR), v. 73, 1971 p 118-125
(BLL-RTS-8508;) Avail: British Library Lending Div., Boston Spa, Engl.: £1.00; 3 BLL photocopy coupons

A sharp decrease is noted in the spectral density of the reflected radiation, starting from a wavelength in the order of

700-1000 km. A sliding mean was applied with an averaging interval of 5000 km, thus filtering out the spatial trend. Low frequency oscillations were filtered, based on cosmos 1127 data on reflected radiation of earth's surface and clouds. This spatial resolution has resulted in further studies of cloud structure and geographic images. J.A.M.

N74-13017 British Library Lending Div., Boston Spa (England).
THE EXPERIENCE OF SIMULTANEOUS INVESTIGATIONS OF THE THREE-DIMENSIONAL STRUCTURE OF THE FIELD OF RADIATION IN THE ATMOSPHERE, USING EQUIPMENT INSTALLED IN AIRCRAFT, AEROSTATS AND ARTIFICIAL SATELLITES
E. P. Barashkova Nov. 1973 21 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 235, 1970 p 7-23 (BLL-RTS-8510) Avail: British Library Lending Div., Boston spa, Engl.: £2.00 or 7 BLL photocopy coupons

Methods for determining the properties of the underlying surface and lower layers of the atmosphere are discussed. The three dimensional structure of the radiation in the earth atmosphere is emphasized. The data obtained by ground stations, aircraft, balloons, and artificial satellites are presented and compared. The types of radiation include the following: (1) solar radiation, (2) long wave radiation, (3) short wave radiation, (4) dissipated radiation, and (5) radiation balance. Author

N74-13018 Saskatchewan Univ., Saskatoon.
THE dc ELECTRIC FIELDS IN THE AURORAL ZONE Ph.D. Thesis
James David Joseph Robar 1973 255 p
Avail: Univ. Microfilms Order No. 73-18665

A self-contained, spin stabilized electric field detector, based on the floating double Langmuir probe principle was designed and constructed to make three component vector measurements of ionospheric electric fields free from dc offset errors. A maximum temporal resolution of 0.64 seconds for true vector measurements and 0.05 seconds for a measurement of a component of the total electric field was obtained with a detector resolution of approximately equal to 0.5 millivolts/meter. Electric field results were obtained below 300 km on two rocket flights (AKD-VB27 and AAF-VB32) in the presence of active aurora during the growth and decay phases of two approximately equal to (300 gamma) negative magnetic bay events. The electric field vector perpendicular to the magnetic field was observed to have a southward component as large as 120 millivolts/meter in magnitude indicating that the westward electrojet was a Hall current. Dissert. Abstr.

N74-13019 Michigan State Univ., East Lansing.
THE APPLICATION OF SPECTRAL METHODS IN THE ANALYSIS AND INTERPRETATION OF GRAVITY DATA: A CRITICAL STUDY Ph.D. Thesis
Robert David Regan 1973 137 p
Avail: Univ. Microfilms Order No. 73-20395

The transformation of involved gravity anomaly expressions such as those of the two-dimensional and three-dimensional prisms are easily calculated by means of a general transformation formula. The mathematical simplicity of the theoretical transforms of these and other ideal gravity anomalies (deterministic data) has distinct interpretational advantages over the more complex spatial domain equations. Despite these advantages, the finite length of practical gravity data precludes the direct application of the frequency domain equations. Calculation of theoretical transforms of segments of ideal anomalies is not feasible and a profile length of approximately six time the depth of the body is required for the finite transform to approximate the theoretical transform. An alternative spectral interpretation method, that is not as restricted by data length, is based on the convolution of the transform of the two-dimensional prism gravity anomaly with the rectangular and Bartlett spectral windows. Dissert. Abstr.

N74-13020 Rice Univ., Houston, Tex.
ROCKET-BASED MEASUREMENT OF AURORAL PARTICLE FLUXES ASSOCIATED WITH FIELD-ALIGNED CURRENTS Ph.D. Thesis
Philip Michael Pazich 1973 186 p
Avail: Univ. Microfilms Order No. 73-21586

A rocket-borne auroral particles experiment was launched from Poker Flat, Alaska, over a homogeneous, relatively stable auroral band at 2122 LT on February 24, 1972. The experiment was designed to measure the field-aligned current carried by energetic E = 0.5 - 20 keV auroral electrons and protons by measuring the energy spectrum and angular distribution of these particles. Several slight folds developed during the flight and the data indicate the rocket crossed a fold in the band. The most intense fluxes of energetic electrons, on the order of ten to the 8th power electrons/sq cm-sec-ster-keV, were detected near the center of the band. The energy spectrum of these electrons contained a peak at approximately 10 kev and the angular distribution of intensity increased at small pitch angles. No significant fluxes of protons were observed at any time and significant fluxes of electrons with E > 40 keV were measured only during a short interval near the center of the band. Dissert. Abstr.

N74-13021 New York Univ., N.Y.
THE TOPSIDE IONOSPHERE DURING SUNRISE AT MID-LATITUDES Ph.D. Thesis
Haim Soicher 1972 153 p
Avail: Univ. Microfilms Order No. 73-21139

The aim of this research is the determination of the structure and variation of the topside ionosphere at mid-latitudes during the sunrise period, based on electron-density measurements obtained with the aid of Alouette 1, the Canadian topsidesounder satellite. Electron-density profiles obtained from Alouette 1 soundings recorded at various North American stations provide the basis for the determination of the scale-height of the electrodensity distribution profiles. The scale-heights profiles, with proper physical assumptions, are interpreted in terms of the comined ion and electron temperatures and the relative ion concentration in the altitude range of 450 to 750 km. In summary, the period prior to ground sunrise is not characterized by ionization increases in the topside ionosphere. It is characterized by temperature changes and accompanying variations in relative ion concentrations. Dissert. Abstr.

N74-13022 Institut d'Aeronomie Spatiale de Belgique, Brussels.
RECENT STRATOSPHERIC SPECTRA OF NO AND NO2
M. Ackerman, J. C. Fontanella (ONERA, Paris), D. Frimout, A. Girard (ONERA, Paris), L. Gramont (ONERA, Paris), N. Louisnard (ONERA, Paris), C. Muller, and D. Nevejans 1973 16 p refs Presented at the Intern. Assoc. of Geomagnetism and Aeronomy Symp. on Aeronomic Processes in the Stratosphere and Mesosphere, Kyoto, Sep. 1973 Submitted for publication Partly sponsored by CNES and the Comite sur les Consequences des Vols Stratospheriques
(Contract N00014-73-C-0076)
(Aeronomica-Acta-A-120-1973) Avail: Issuing Activity

Nitrogen and nitrogen dioxide absorption spectra obtained by means of an infrared grill spectrometer from a balloon gondola and Concorde are presented. The corresponding stratospheric abundances of these gases is deduced. ESRO

N74-13023*# Geological Survey, Washington, D.C.
IRON-ABSORPTION BAND ANALYSIS FOR THE DISCRIMINATION OF IRON-RICH ZONES Progress Report, 1 Sep. - 31 Oct. 1973
Lawrence C. Rowan, Principal Investigator 6 Oct. 1973 7 p ref ERTS
(NASA Order S-70243-AG-4)
(E74-10096; NASA-CR-136087) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N74-13024*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
[MULTIDISCIPLINARY RESEARCH FROM ERTS-1 DATA] Bimonthly Report, 1 Sep. - 31 Oct. 1973
Frederick J. Thomson, F. C. Polcyn, M. Leonard Bryan, I. J. Sattinger, W. A. Malila, R. F. Nalepka, C. T. Wezernak, R. Horvath, and R. K. Vincent, Principal Investigators 20 Nov. 1973 55 p Original contains color imagery. Original photography may be purchased form the EROS Data Center, 10th and Dakota Avenue,

Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E74-10097; NASA-CR-136088; Rept-193300-31-L; BMR-7)
Avail: NTIS HC $4.75 CSCL 05B

There are no author-identified significant results in this report.

N74-13025*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
ERTS-A IMAGERY INTERPRETATION TECHNIQUES IN THE TENNESSEE VALLEY Progress Report, 25 Sep. - 25 Nov. 1973
Robert E. Bodenheimer, Principal Investigator 4 Dec. 1973 2 p ERTS
(Contract NAS5-21875)
(E74-10098; NASA-CR-136089) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N74-13026*# Arizona Univ., Tucson.
A STUDY TO EXPLORE THE USE OF REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report, period ending 15 Oct. 1973
William G. McGinnies, Principal Investigator 15 Oct. 1973 2 p ERTS
(Contract NAS5-21812)
(E74-10099; NASA-CR-136090) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N74-13027*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Nov. 1973
Kenneth Watson, Principal Investigator Nov. 1973 3 p EREP
(NASA Order T-6555-B)
(E74-10100; NASA-CR-136091) Avail: NTIS HC $3.00 CSCL 08E

There are no author-identified significant results in this report.

N74-13028*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
AUTOMATIC PHOTOINTERPRETATION FOR LAND USE MANAGEMENT IN MINNESOTA Progress Report
George D. Swanlund, Principal Investigator and L. Kirvida Oct. 1973 2 p ERTS
(Contract NAS5-21742)
(E74-10101; NASA-CR-136092; PR-9) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13029*# Stanford Research Inst., Menlo Park, Calif.
STUDY OF TIME-LAPSE DATA PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS Progress Report, 7 Sep. - 6 Nov. 1973
Sidney M. Serebreny, Principal Investigator 7 Nov. 1973 6 p ERTS
(Contract NAS5-21841)
(E74-10102; NASA-CR-136093) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N74-13030*# Geological Survey, Denver, Colo.
THERMAL SURVEILLANCE OF VOLCANOES OF THE CASCADE RANGE UTILIZING ERTS DCP SYSTEMS AND IMAGERY Progress Report, 1 Jan. - 1 Jul. 1973
Jules D. Friedman, Principal Investigator 1 Jul. 1973 7 p ERTS
(NASA Order S-70243-AG)
(E74-10103; NASA-CR-136094) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Successful installation of DCP sets at Mt. Baker volcano and at Mt. St. Helens volcano, Washington, completed the installation phase of experiment SR 251. Aerial IR scanner missions over the Cascade volcanoes were completed with a mission April 29th which provided thermographic IR images of Glacier Peak, Mt. Baker, Mt. St. Helens, Mt. Rainier, and Mt. Adams. Earlier repetitive coverage had obtained IR images depicting thermal anomalies of Lassen Volcanic National Park, Shasta, Crater Lake, and the northern Cascades. The April 29th mission and subsequent ground reconnaissance yielded new information on 48 heretofore unreported pinpoint radiation anomalies, of possible fumarolic origin, on the flanks of Mt. Rainier and several new thermal points on Mt. Baker. Cartographic plots of these anomalies, in conjunction with surface temperature and other data obtained as a result of experiment SR 251 will permit estimation of radiation heat loss during the repose periods of the host volcanoes.

N74-13031*# Geological Survey, Phoenix, Ariz. Water Resources Div.
APPLICATIONS OF ERTS-1 DATA COLLECTION SYSTEM (DCS) IN THE ARIZONA REGIONAL ECOLOGICAL TEST SITE (ARETS) Progress Report, 15 Dec. 1972 - 15 Jun. 1973
Herbert H. Schumann, Principal Investigator 15 Jun. 1973 9 p ref ERTS
(NASA Order S-70243-AG-7)
(E74-10104; NASA-CR-136095) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The DCS water-stage data from the USGS streamflow gaging station on the Verde River near Camp Verde furnished information sufficient for the accurate computation of daily mean streamflow rates during the first 2 months of operation. Daily mean flow rates computed from the DCS data agreed with those computed from the digital recorder data within + or - 5% during periods of stable or slowly changing flow and within + or - 10% during periods of rapidly changing high flow. The SRP was furnished near-real time DCS information on snow moisture content and streamflow rates for use in the management and operation of the multiple-use reservoir system. The SRP, by prudent water management and the use of near-real time hydrologic data furnished by microwave and ERTS DCS telemetry, was successful in anticipating the amount of flow into the Salt and Verde Rivers and in the subsequent release of water at rates that did not create flooding in metropolitan Phoenix. Only minor flooding occurred along the Gila River west of Phoenix. According to the Maricopa County Civil Defense agency, wage and salary losses of about $11,400,000 resulted from closing of roads across the Salt River in the winter and spring of 1972-73; however, the number and duration of the closing were minimized by use of DCS data.

N74-13032*# Geological Survey, Tucson, Ariz.
DYNAMICS OF DISTRIBUTION AND DENSITY OF PHREATOPHYTES AND OTHER ARID-LAND PLANT COMMUNITIES Progress Report, 1 Jan. - 30 Jun. 1973
Raymond M. Turner, Principal Investigator 1 Jul. 1973 22 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-2)
(E74-10105; NASA-CR-136096) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Six ERTS-1 images of the Tucson area, Arizona were analyzed to detect seasonal flushes of plant growth. Paired MSS-6 and MSS-5 bulk images were analyzed, using a ratioing technique, on the Electronic Satellite Image Analysis Console at Stanford Research Institute. Because of unique phenology, desert areas, covered only briefly by dense growths of ephemeral plants, are readily discerned. Grassland, evergreen forest, and riparian communities are also uniquely defined by their phenologies. Relatively sterile areas with little or no plant growth are easily discerned as are areas with varying degrees of plant productivity. The ratioing procedure detects plant coverage in excess of a threshold lying between 25% and 50%. The method is flexible and other coverage thresholds can be used.

N74-13033*# Geological Survey, Washington, D.C.
OVERALL EVALUATION OF ERTS IMAGERY FOR CARTOGRAPHIC APPLICATION Progress Report, 1 Jul. - 1 Sep. 1973
Alden P. Colvocoresses, Principal Investigator 24 Sep. 1973 16 p ref ERTS
(NASA Order S-70243-AG-2)
(E74-10106; NASA-CR-136097) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13034*# Geological Survey, Washington, D.C. Topographic Div.
INVESTIGATION OF ERTS/RBV IMAGERY FOR PHOTOMAPPING OF THE UNITED STATES Progress Report, 1 Jul. - 31 Aug. 1973
Joseph T. Pilonero, Principal Investigator 1 Sep. 1973 2 p ERTS
(NASA Order S-70243-AG)
(E74-10107; NASA-CR-136098) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13035*# Geological Survey, Washington, D.C.
THE CARTOGRAPHIC APPLICATION OF ERTS/RBV IMAGERY IN POLAR REGIONS Progress Report, 1 Jul. - 31 Aug. 1973
William R. MacDonald, Principal Investigator 1 Sep. 1973 3 p ERTS
(NASA Order S-70243-AG-2)
(E74-10108; NASA-CR-136099) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13036*# Geological Survey, Washington, D.C. Geographic Applications Program.
CENTRAL ATLANTIC REGIONAL ECOLOGICAL TEST SITE (CARETS): A PROTOTYPE REGIONAL ENVIRONMENTAL INFORMATION SYSTEM Progress Report, 1 Jul. - 31 Aug. 1973
Robert H. Alexander, Principal Investigator 1 Sep. 1973 12 p ERTS
(NASA Order S-70243-AG-3)
(E74-10109; NASA-CR-136100) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N74-13037*# Environmental Research Inst. of Michigan, Ann Arbor.
CORRELATION OF ERTS MSS DATA AND EARTH COORDINATE SYSTEMS
William A. Malila, Principal Investigator, Ross H. Hieber, and Arthur P. McCleer Aug. 1973 15 p refs Presented at Purdue Conf. on Machine Process of Remotely Sensed Data, 16-18 Oct. 1973 ERTS
(Contracts NAS5-21783; NAS5-21834)
(E74-10110; NASA-CR-136101; Rept-193300-18-SA/J) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. Experience has revealed a problem in the analysis and interpretation of ERTS-1 multispectral scanner (MSS) data. The problem is one of accurately correlating ERTS-1 MSS pixels with analysis areas specified on aerial photographs or topographic maps for training recognition computers and/or evaluating recognition results. It is difficult for an analyst to accurately identify which ERTS-1 pixels on a digital image display belong to specific areas and test plots, especially when they are small. A computer-aided procedure to correlate coordinates from topographic maps and/or aerial photographs with ERTS-1 data coordinates has been developed. In the procedure, a map transformation from earth coordinates to ERTS-1 scan line and point numbers is calculated using selected ground control points nad the method of least squares. The map transformation is then applied to the earth coordinates of selected areas to obtain the corresponding ERTS-1 point and line numbers. An optional provision allows moving the boundaries of the plots inward by variable distances so the selected pixels will not overlap adjacent features.

N74-13038*# Arizona Univ., Tucson. Office of Arid Lands Studies.
A STUDY TO EXPLORE THE USE OF ORBITAL REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report, period ending 15 Aug. 1973
William G. McGinnies, Edward F. Haase, Principal Investigators, and H. Brad Musick, comp. 15 Aug. 1973 30 p ERTS
(Contract NAS5-21812)
(E74-10111; NASA-CR-136102) Avail: NTIS HC $3.50 CSCL 08F

The author has identified the following significant results. Ground truth spectral signature data for various types of scenes, including ground with and without annuals, and various shrubs, were collected. When these signature data are plotted with infrared (MSS band 6 or 7) reflectivity on one axis and red (MSS band 5) reflectivity on the other axis, clusters of data from the various types of scenes are distinct. This method of expressing spectral signature data appears to be more useful for distinguishing types of scenes than a simple infrared to red reflectivity ration. Large areas of varnished desert pavement are visible and mappable on ERTS-1 and high altitude aircraft imagery. A large scale vegetation pattern was found to be correlated with the presence of the desert pavement. The large scale correlation was used in mapping the vegetation of the area. It was found that a distinctive soil type was associated with the presence of the varnished desert pavement. The high salinity and exchangeable sodium percentage of this soil type provide a basis for the explanation of both the large scale and small scale vegetation pattern.

N74-13039*# Mississippi State Univ., State College. Inst. for Environmental Studies.
APPLICATION OF ERTS-A DATA TO AGRICULTURAL PRACTICES IN THE MISSISSIPPI DELTA REGION Progress Report, period ending 30 Nov. 1973
C. W. Bouchillon, Principal Investigator 5 Dec. 1973 10 p ERTS
(Contract NAS5-21881)
(E74-10112; NASA-CR-136108; PR-5) Avail: NTIS HC $3.00 CSCL 02C

There are no author-identified significant results in this report.

N74-13040*# Texas A&M Univ., College Station. Remote Sensing Center.
MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION Progress Report, Apr. - Sep. 1973
John W. Rouse, Jr., Principal Investigator, R. H. Haas, D. W. Deering, and J. A. Schell Oct. 1973 86 p ERTS
(Contract NAS5-21857)
(E74-10113; NASA-CR-136103; RSC-1978-2) Avail: NTIS HC $6.50 CSCL 08F

The author has identified the following significant results. The Great Plains Corridor rangeland project utilizes natural vegetation systems as phenological indicators of seasonal development and climatic effects upon regional growth conditions. A method has been developed for quantitative measurement of vegetation conditions over broad regions using ERTS-1 MSS data. Radiance values recorded in ERTS-1 spectral bands 5 and 7, corrected for sun angle, are used to compute a band ratio parameter which is shown to be correlated with green biomass and vegetation moisture content. This report details the progress being made toward determining factors associated with the transformed vegetation index (TVI) and limitations on the method. During the first year of ERTS-1 operation (cycles 1-20), an average of 50% usable ERTS-1 data was obtained for the ten Great Plains Corridor test sites.

N74-13041*# California Earth Science Corp., Santa Monica.
THE APPLICATION OF SKYLAB IMAGERY TO ANALYSIS OF FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Nov. 1973
Paul M. Merifield, Principal Investigator 5 Dec. 1973 3 p

EREP
(Contract NAS2-7698)
(E74-10114; NASA-CR-136126; MPR-6) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. Frame 114 of the Salton Sea area was studied in all bands to analyze the appearance of important faults. These faults were also studied in the field as well as from aircraft and in aerial photography. The San Andreas/Banning and the Mission Creek faults can be traced across Coachella Valley even though they are buried by alluvium. The faults form ground water barriers and the near surface ground water on the northeast sides of the faults supports patches of vegetation (mesquite and palms) in an otherwise barren desert. These oases are best seen in band 3 (color IR). Otherwise, faults are best seen in band 4 (aerial color). Of the B and W bands, 5 (red) is best for delineating faults. Bands 1 and 2 are excessively grainy and the resolution is considerably inferior to the other bands.

N74-13042*# Mississippi State Univ., State College. Dept. of Electrical Engineering.
STUDY OF THE APPLICATION OF REMOTE SENSING DATA TO LAND USE PLANNING ON THE MISSISSIPPI GULF COAST Progress Report, period ending 30 Nov. 1973
Frank Ingels, Principal Investigator 5 Dec. 1973 10 p ERTS
(Contract NAS5-21817)
(E74-10115; NASA-CR-136127; PR-6) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13043*# Alaska Univ., Fairbanks.
EVALUATION OF FEASIBILITY OF MAPPING SEISMICALLY ACTIVE FAULTS IN ALASKA Bimonthly Progress Report
Larry D. Gedney, Principal Investigator 30 Nov. 1973 2 p refs ERTS
(Contract NAS5-21833)
(E74-10116; NASA-CR-136128; BMPR-8) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13044*# Alaska Univ., Fairbanks.
ERTS-A DATA AS A TEACHING AND RESEARCH TOOL IN THE DEPARTMENT OF GEOLOGY Biomonthly Progress Report
Donald Grybeck, Principal Investigator 2 Dec. 1973 2 p ERTS
(Contract NAS5-21833)
(E74-10117; NASA-CR-136130; BMPR-8) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N74-13045*# Alaska Univ., Fairbanks.
SEA, ICE AND SURFACE WATER CIRCULATION, ALASKAN CONTINENTAL SHELF Bimonthly Progress Report
G. D. Sharma, F. F. Wright, and J. J. Burns, Principal Investigators [1973] 5 p ERTS
(Contract NAS5-21833)
(E74-10118; NASA-CR-136131; BMPR-8) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. ERTS-1 imagery has been extremely useful in understanding the tidal water movements in a large estuary such as Cook Inlet. As more imagery obtained during various tidal stages become available it appears that complex and fast changing micro-circulation patterns develop in various regions of Cook Inlet during each advancing and receding tide. More ERTS-1 synoptic imagery is needed to fully understand the effect of the approach of tidal front on the water movements in the various regions through the estuary. The conventional onboard ship data gathered during various cruises although revealed the overall circulation pattern in Cook Inlet but failed to show micro-subgyres which develop in various regions during each tide which are discernible on ther ERTS-1 imagery. Suspended load distribution in the Bering Sea during summer varies significantly. In areas of phytoplankton bloom and at the river mouths the suspended load is higher than the 1 mg/1 which is found over most areas. The influence of major rivers on temperature, salinity, and suspended load in surface water as well as at shallow depth is apparent. On the Bering shelf a strong pycnocline generally at depth 10-20 m is formed by surface fresh water flow which retains sediment in suspension over extended periods.

N74-13046*# Alaska Univ., Fairbanks. Inst. of Marine Science.
THE CIRCULATION OF PRINCE WILLIAM SOUND Bimonthly Progress Report
Robin D. Muench, Principal Investigator 30 Nov. 1973 2 p ERTS
(Contract NAS5-21833)
(E74-10119; NASA-CR-136132; BMPR-8) Avail: NTIS HC $3.00 CSCL 08C

There are no author-identified significant results in this report.

N74-13047*# Alaska Univ., Fairbanks.
APPLICATION OF ERTS-1 IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER Bimonthly Progress Report
Peter C. Lent, Principal Investigator 30 Nov. 1973 5 p ERTS
(Contract NAS5-21833)
(E74-10120; NASA-CR-136165; BMPR-8) Avail: NTIS HC $3.00 CSCL 06C

There are no author-identified significant results in this report.

N74-13048*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Nov. 1973
Irvin J. Sattinger, Principal Investigator 7 Dec. 1973 2 p EREP
(Contract NAS9-13283)
(E74-10121; NASA-CR-136166; ERIM-103300-14-L) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13049*# Iowa Univ., Iowa City.
UTILIZING ERTS-1 IMAGERY FOR TECTONIC ANALYSIS THROUGH STUDY OF THE BIGHORN MOUNTAINS REGION Progress Report, 16 Sep. - 15 Nov. 1973
Richard A. Hoppin, Principal Investigator 15 Nov. 1973 1 p ERTS
(Contract NAS5-21852)
(E74-10122; NASA-CR-136167) Avail: NTIS HC $3.00 CSCL 08E

There are no author-identified significant results in this report.

N74-13050*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Monthly Progress Report, 16 Nov. - 15 Dec. 1973
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 22 Dec. 1973 5 p EREP
(NASA Order T-4106-B)
(E74-10123; NASA-CR-136168; MPR-8) Avail: NTIS HC $3.00 CSCL 02F

There are no author-identified significant results in this report.

N74-13051*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A Bimonthly Progress Report, 7 Oct. - 6 Dec. 1973
Harold R. Henry and George P. Whittle, Principal Investigators 6 Dec. 1973 66 p ref ERTS
(Contract NAS5-21876)

(E74-10124; NASA-CR-136169; BMPR-7) Avail: NTIS HC $5.50 CSCL 08B

There are no author-identified significant results in this report.

N74-13052*# Purdue Univ., Lafayette, Ind.
A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN Bimonthly Progress Report, 1 Sep. - 31 Oct. 1973
David A. Landgrebe, Principal Investigator 31 Oct. 1973 6 p refs ERTS
(Contract NAS5-21773)
(E74-10125; NASA-CR-136170) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. In soil association mapping, computerized analysis of ERTS-1 MSS data has yielded images which will prove useful in the ongoing Cooperative Soil Survey program, involving the Soil Conservation Service of USDA and other state and local agencies. In the present mode of operation, a soil survey for a county may take up to 5 years to be completed. Results indicate that a great deal of soils information can be extracted from ERTS-1 data by computer analysis. This information is expected to be very valuable in the premapping conference phase of a soil survey, resulting in more efficient field operations during the actual mapping. In the earth surface features mapping effort it was found that temporal data improved the classification accuracy of forest classification in Tippecanoe County, Indiana. In water resources study a severe scanner look angle effect was observed in the aircraft scanner data of a test lake which was not present in ERTS-1 data of the same site. This effect was greatly accentuated by surface roughness caused by strong winds. Quantitative evaluation of urban features classification in ERTS-1 data was obtained. An 87.1% test accuracy was obtained for eight categories in Marion County, Indiana.

N74-13053*# Kansas Univ. Center for Research, Inc., Lawrence.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB: INVESTIGATIONS IN PROGRESS SL2 AND SL3
Joe R. Eagleman, Ernest C. Pogge, and Richard K. Moore, Principal Investigators [1973] 3 p EREP
(Contract NAS9-13273)
(E74-10126; NASA-CR-136171) Avail: NTIS HC $3.00 CSCL 08M

There are no author-identified significant results in this report.

N74-13054*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND AND DETECTION OF FOREST STRESS Progress Report, 1 Sep. - 31 Oct. 1973
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 20 Nov. 1973 15 p ERTS
(NASA Order S-70251-AG)
(E74-10127; NASA-CR-136172; FS-I-6; PR-6) Avail: NTIS HC $3.00 CSCL 02F

The author has identified the following significant results. Eucalyptus tree stands killed by low temperatures in December 1972 were outlined by image enhancement of two separate dates of ERTS-1 images (January 22, 1973-I.D. 1183-18175 and April 22, 1973-I.D. 1273-18183). Three stands larger than 500 meters in size were detected very accurately. In Colorado, range and grassland communities were analyzed by visual interpretation of color composite scene I.D. 1028-17135. It was found that mixtures of plant litter, amount and kind of bare soil, and plant foliage cover made classification of grasslands very difficult. Changes in forest land use were detected on areas as small as 5 acres when ERTS-1 color composite scene 1264-15445 (April 13, 1973) was compared with 1966 ASCS index mosaics (scale 1:60,000). Verification of the changes were made from RB-57 underflight CIR transparencies (scale 1:120,000).

N74-13055*# Norwegian Water Resources and Electricity Board, Oslo.
EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS Progress Report, Apr. - Sep. 1973
Gunnar Oestrem, Principal Investigator Oct. 1973 10 p refs Sponsored by NASA ERTS
(E74-10128; NASA-CR-136173; Rept-2) Avail: NTIS HC $3.00 CSCL 08L

The author has identified the following significant results. The transient snowline on five outlet glaciers from the Jostedalsbreen ice-cap in Southwestern Norway could be determined from ERTS-1 image 1336-10260, when bands MSS 5, 6, and 7 were combined in an additive color viewer. The snowline was situated at a very low altitude at the time of imagery (24 June 1973) indicating that glacier melt was behind normal schedule, a fact that has a hydrologic bearing: one could expect less melt water in the streams. The idea to use ERTS-1 imagery in snowline determinations proved realistic and relatively easy to apply in practice. The method will be useful to estimate the glaciers' mass balance for large areas, provided some ground truth observations are made. Images from the end of the melt season are of course vital in this work.

N74-13056*# Geological Survey, Denver, Colo.
A STUDY OF MORPHOLOGY, PROVENANCE, AND MOVEMENT OF DESERT SAND SEAS IN AFRICA, ASIA, AND AUSTRALIA Progress Report, 1 Sep. - 31 Oct. 1973
Edwin D. McKee and Carol S. Breed, Principal Investigators 1 Nov. 1973 25 p ERTS
(NASA Order S-70243-AG-4)
(E74-10129; NASA-CR-136174) Avail: NTIS HC $3.25 CSCL 08M

The author has identified the following significant results. The regional studies of sand seas made possible by analysis of ERTS-1 imagery have established that widespread patterns of eolian sand deposition exist in many places and that similarities and differences in these patterns can be measured and compared, on a worldwide scale. Analysis of the relationships of depositional patterns to controlling factors will require completion of the color mosaics of the test sites, and acquisition of adequate supporting ground truth data, especially wind data. Once analyses are complete, the results will be applicable to the regional study of ancient eolian sandstones. Such sandstones were formed many millions of years ago under conditions believed to be indentical to those under which the sand seas that are observed being formed today. The understanding of the deposition of eolian sands provided by analysis of ERTS-1 imagery will be applicable to an understanding of the structure and distribution of ancient eolian sandstones and their potential as reservoirs of oil and water.

N74-13057*# Alaska Univ., Palmer.
IDENTIFICATION OF PHENOLOGICAL STAGES AND VEGETATIVE TYPES FOR LAND USE CLASSIFICATION Bimonthly Progress Report
Jay D. McKendrick, Principal Investigator 30 Nov. 1973 32 p ERTS
(Contract NAS5-21833)
(E74-10130; NASA-CR-136175; BMPR-8) Avail: NTIS HC $3.75 CSCL 08F

The author has identified the following significant results. Classification of digital data for mapping Alaskan vegetation has been compared to ground truth data and found to have accuracies as high as 90%. These classifications are broad scale types as are currently being used on the Major Ecosystems of Alaska map prepared by the Joint Federal-State Land Use Planning Commission for Alaska. Cost estimates for several options using the ERTS-1 digital data to map the Alaskan land mass at the 1:250,000 scale ranged between $2.17 to $1.49 per square mile.

N74-13058*# Alaska Univ., Fairbanks.
COORDINATION AND ESTABLISHMENT OF CENTRALIZED FACILITIES AND SERVICES FOR THE UNIVERSITY OF ALASKA ERTS SURVEY OF THE ALASKAN ENVIRONMENT Bimonthly Progress Report
Albert E. Belon, Principal Investigator 30 Nov. 1973 8 p refs ERTS
(Contract NAS5-21833)
(E74-10131; NASA-CR-136176; BMPR-8) Avail: NTIS HC $3.00 CSCL 14B

There are no author-identified significant results in this report.

N74-13059*# Delaware Univ., Newark. Coll. of Marine Studies.
MAPPING COASTAL VEGETATION, LAND USE AND ENVIRONMENTAL IMPACT FROM ERTS-1 Report on Significant Results
V. Klemas, Principal Investigator 13 Dec. 1973 2 p ERTS (Contract NAS5-21837)
(E74-10132; NASA-CR-136177) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Digital analysis of ERTS-1 imagery was used in an attempt to map and inventory the significant ecological communities of Delaware's coastal zone. Eight vegetation and land use discrimination classes were selected: (1) Phragmites communis (giant reed grass); (2) Spartina alterniflora (salt marsh cord grass); (3) Spartina patens (salt marsh hay); (4) shallow water and exposed mud; (5) deep water (greater than 2 m); (6) forest; (7) agriculture; and (8) exposed sand and concrete. Canonical analysis showed the following classification accuracies: Spartina alterniflora, exposed sand, concrete, and forested land - 94% to 100%; shallow water - mud and deep water - 88% and 93% respectively; Phragmites communis 83%; Spartina patens - 52%. Classification accuracy for agriculture was very poor (51%). Limitations of time and available class-memory space resulted in limiting the analysis of agriculture to very gross identification of a class which actually consists of many varied signature classes. Abundant ground truth was available in the form of vegetation maps compiled from color and color infrared photographs. It is believed that with further refinement of training set selection, sufficiently accurate results can be obtained for all categories.

N74-13060*# Delaware Univ., Newark. Coll. of Marine Studies.
MONITORING COASTAL WATER PROPERTIES AND CIRCULATION FROM ERTS-1
V. Klemas, Principal Investigator 13 Dec. 1973 2 p ERTS (Contract NAS5-21837)
(E74-10133; NASA-CR-136178) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. Imagery and digital tapes from nine successful ERTS-1 passes over Delaware Bay during different portions of the tidal cycle have been analyzed with special emphasis on turbidity, current circulation, waste disposal plumes, and convergent boundaries between different water masses. ERTS-1 image radiance correlated well with Secchi depth and suspended sediment concentration. MSS band 5 seemed to give the best representation of sediment load in the upper one meter of the water column. Circulation patterns observed by ERTS-1 during different parts of the tidal cycle, agreed well with predicted and measured currents throughout Delaware Bay. During flood tide the suspended sediment as visible from ERTS-1 also correlated well with the depth profile. Convergent shear boundaries between different water masses were observed from ERTS-1, with foam lines containing high concentrations of lead, mercury, and other toxic substances. Several fronts have been seen. Those near the mouth of the bay are associated with the tidal intrusion of shelf water. Fronts in the interior of the bay on the Delaware side appear to be associated with velocity shears induced by differences in bottom topography. Waste disposal plumes have benn detected 36 miles offshore.

N74-13061*# Ministry of Natural Resources, Nairobi (Kenya).
[THE APPLICABILITY OF ERTS-1 DATA COVERING THE MAJOR LANDFORMS OF KENYA] Final Report
J. H. O. Omino, Principal Investigator 7 Dec. 1973 10 p Sponsored by NASA ERTS
(E74-10134; NASA-CR-136179) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Five investigators report on the applicability of ERTS-1 data covering the major landforms of Kenya. Deficiencies due to lack of equipment, repetitive coverage and interpretation know-how are also reported on. Revision of lake shorelines is an immediate benefit. Basement system metasediments are rapidly differentiated, but dune areas are not readily distinguishable from sandy soils. Forest, moorland, high altitude grass, tea, and conifer plantations are readily distinguished, with podocarpus forest especially distinguishable from podocarpus/juniperus forest. In the arid areas physiographic features, indicating the major soil types, are readily identified and mapped. Preliminary vegetation type analysis in the Mara Game Reserve indicates that in a typical savannah area about 36% of the vegetation types are distinguishable at a scale of 1:1 million as well as drainage patterns and terrain features.

N74-13062*# Bureau de Recherches Geologiques et Minieres, Orleans (France).
STRUCTURAL INVESTIGATIONS IN THE MASSIF-CENTRAL, FRANCE
Guy Weecksteen, Principal Investigator and J.-Y. Scanvic [1973] 20 p refs Sponsored by NASA ERTS
(E74-10135; NASA-CR-136180) Avail: NTIS HC $3.00 CSCL 08E

There are no author-identified significant results in this report.

N74-13063*# Alaska Univ., Fairbanks.
IDENTIFICATION, DEFINITION AND MAPPING OF TERRESTRIAL ECOSYSTEMS IN INTERIOR ALASKA Bimonthly Progress Report
James H. Anderson, Principal Investigator 30 Nov. 1973 16 p refs ERTS
(Contract NAS5-21833)
(E74-10137; NASA-CR-136182; BMPR-8) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The vegetation map in preparation at the time of the last report was refined and labeled. This map is presented as an indication of the spatial and classificatory detail possible from interpretations of enlarged ERTS-1 color photographs. Using this map, areas covered by the several vegetation types characterized by white spruce were determined by planimetry. A 1:63,360 scale land use map of the Juneau area was drawn. This map incorporates the land use classification system now under development by the U.S. Geological Survey. The ERTS-1 images used in making the Juneau map were used to determine changes in surface area of the terminal zones of advancing and receding glaciers, the Taku, Norris, and Mendenhall. A new 1:63,360 scale land use map of the Bonanza Creek Experimental Forest and vicinity was drawn. Several excellent new sciences of test areas were received from NASA in color-infrared transparency format. These are being used for making photographic prints for analysis and mapping according to procedures outlined in this report.

N74-13064*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1-30 Nov. 1973
A. G. Mourad and D. M. J. Fubara, Principal Investigators 30 Nov. 1973 13 p refs EREP
(Contract NAS9-13276)
(E74-10138; NASA-CR-136183; PR-9) Avail: NTIS HC $3.00 CSCL 08E

There are no author-identified significant results in this report.

N74-13065*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENT USING THE EREP OF SKYLAB Quarterly Progress Report, 7 Aug. - 7 Nov. 1973
David T. Chang, Principal Investigator 19 Dec. 1973 2 p (Contract NAS9-13343)
(E74-10139; NASA-CR-136184; P-410-2; QPR-2) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N74-13066*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA

Progress Report, 1 Oct. - 30 Nov. 1973
John W. Hannah, Garland L. Thomas, and Ferd Esparza, Principal Investigators 30 Nov. 1973 10 p Prepared in cooperation with Brevard County Planning Dept., Titusville, Fla. ERTS
(Contract NAS5-21847)
(E74-10140; NASA-TM-X-69302) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-13067*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Nov. 1973
Jack G. Quade, Principal Investigator Nov. 1973 3 p EREP
(Contract NAS9-13274)
(E74-10141; NASA-CR-136186) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N74-13068*# City Coll. of the City of New York. Inst. of Oceanography.
A JOINT METEOROLOGICAL, OCEANOGRAPHIC AND SENSOR EVALUATION PROGRAM FOR EXPERIMENT S193 ON SKYLAB Monthly Plans and Progress Report, 14 Nov. - 15 Dec. 1973
Willard J. Pierson, R. K. Moore, and E. P. McClain, Principal Investigators 15 Dec. 1973 3 p EREP
(Contract NAS9-13642)
(E74-10142; NASA-CR-136187) Avail: NTIS HC $3.00 CSCL 14B

There are no author-identified significant results in this report.

N74-13069*# Texas A&M Univ., College Station. Remote Sensing Center.
MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION Progress Report, 28 Sep. - 27 Nov. 1973
John W. Rouse, Jr., Principal Investigator 27 Nov. 1973 12 p ERTS
(Contract NAS5-21857)
(E74-10143; NASA-CR-136188; PR-5) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Emphasis has been given to an inventory of land resource types and land use at the ten Great Plains Corridor test sites. A resource and land use classification system was developed which uses available soil survey information and interpretations from NASA obtained high flight aerial photography to locate discrete areas of similar rangeland vegetation. Existing classification systems, even those developed for use with remote sensor data, were found to be inadequate for this project. This system is expected to be of general use for remote sensing related to land use and management. It has specific applicability to any effort aimed at regional use of ERTS-1 MSS digital data products. A preliminary assessment of the relative importance of rangelands in the Great Plains Corridor states indicates that the value of the livestock industry supported by this resource exceeds 23 billion dollars. The development of a Rangeland Feed Conditions index for this region could be used by more than 400,000 farm and ranch operators involved in the production of more than 40% of the nation's beef and much of the country's grain.

N74-13070*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC CALIBRATION OF EREP IMAGERY AND OCEANOGRAPHY OF BLOCK ISLAND SOUND Monthly Progress Report, Nov. 1973
Edward Yost, Principal Investigator 20 Nov. 1973 2 p EREP
(Contract NAS9-13308)
(E74-10144; NASA-CR-136189) Avail: NTIS HC $3.00 CSCL 08J

N74-13071*# Wyoming Univ., Laramie. Remote Sensing Lab.
VEGETATION ANALYSIS IN THE LARAMIE BASIN, WYOMING FROM ERTS-1 IMAGERY Special Report
Michael A. Evans and F. R. Redfern Nov. 1973 54 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E74-10145; NASA-CR-136190; ERTS-1-573-5) Avail: NTIS HC $4.75 CSCL 08F

The author has identified the following significant results. The application of ERTS-1 imagery to vegetation mapping and identification was tested and confirmed by field checking. ERTS-1 imagery interpretation and density contour mapping allows definition of minute vegetation features and estimation of vegetative biomass and species composition. Large- and small-scale vegetation maps were constructed for test areas in the Laramie Basin and Laramie mountains of Wyoming. Vegetative features reflecting grazing intensity, moisture availability, changes within the growing season, cutting of hay crops, and plant community constituents in forest and grassland are discussed and illustrated. Theoretical considerations of scattering, sun angle, slope, and instrument aperture upon image and map resolution were investigated. Future suggestions for applications of ERTS-1 data to vegetative analysis are included.

N74-13072*# Bureau of Reclamation, Denver, Colo.
MONITOR WEATHER CONDITIONS FOR CLOUD SEEDING CONTROL Progress Report, 1 Sep. - 31 Oct. 1973
Archie M. Kahan, Principal Investigator 1 Nov. 1973 96 p refs ERTS
(NASA Order S-70243-AG-8)
(E74-10146; NASA-CR-136205) Avail: NTIS HC $7.00 CSCL 04B

The author has identified the following significant results. The near real-time DCS platform data transfer to the time-share compare is a working reality. Six stations are now being automatically monitored and displayed with a system delay of 3 to 8 hours from time of data transmission to time of data accessibility on the computer. The DCS platform system has proven itself a valuable tool for near real-time monitoring of mountain precipitation. Data from Wolf Creek Pass were an important input in making the decision when to suspend seeding operations to avoid exceeding suspension criteria in that area. The DCS platforms, as deployed in this investigation, have proven themselves to be reliable weather resistant systems for winter mountain environments in the southern Colorado mountains.

N74-13073# National Oceanographic Data Center, Washington, D.C.
PRELIMINARY NATIONAL MARINE DATA INVENTORY SUMMARY FOR 1971
Oct. 1973 45 p refs
Avail: NTIS HC $4.25

The National Marine Data Inventory (NAMDI), which is an inventory of environmental marine data and sample collections somewhat similar to an abbreviated cruise report is presented. It is the only national marine environmental data inventory existent in the United States: it has been expanded to include participants from Federal agencies, State, local, industrial, private, and educational organizations. Seventy-four (74) institutions or groups have contributed to the NAMDI. NAMDI is an information bank that contains the following information: (1) data types collected, (2) name of collector, (3) geographic location (10 deg geographic squares), time period, (4) quantitative information on data units collected, and (5) data location or sample repository. Author

N74-13074# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL EQUIPMENT
B. K. Vikulin, ed. 19 Nov. 1973 41 p refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 33 p
(JPRS-60574) Avail: NTIS HC $4.25

Research is reported on the following topics: (1) new geophysical equipment in the U.S.S.R., (2) the use of an auxiliary

seismic station, and (5) transistorized seismic signal amplifiers. For individual titles, see N74-13075 through N74-13079.

N74-13075 Joint Publications Research Service, Arlington, Va.
NEW GEOPHYSICAL EQUIPMENT c14
V. M. Chashnik *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 1-18 Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 3-18 (For availability see N74-13074 04-13)

Various types of geophysical equipment which have recently been developed in the U.S.S.R. are described. These include: (1) an airborne quantum magnetometer, (2) a digital seismic surveying station, (3) a frequency sounding device, (4) an automatic electrical surveying pointer compensator, (5) a narrow band prospecting gravimeter, (6) a four-channel tape logging converter, (7) a vacuum sensor for a roentgenoradiometric analyzer, (8) an automatic gas logging station, (9) a general purpose gamma-gamma density meter, and (10) a thermoelectric well flowmeter. D.L.G.

N74-13076 Joint Publications Research Service, Arlington, Va.
USING AN AUXILIARY FIELD TO MEASURE COMPONENTS OF THE EARTH'S MAGNETIC FIELD
G. V. Alekseyev, N. V. Alekseyev, and A. Ya. Rotshteyn *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 19-24 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 19-23 (For availability see N74-13074 04-13)

The use of quantum magnetometers to measure the components of a geomagnetic field from a moving object is discussed in terms of the required autocompensation system. It is pointed out that, when measuring X, Y, or Z, the autocompensation system becomes extremely complex, since it requires the simultaneous use of two channels to compensate for the two unmeasured components while the third is being measured. A method is proposed to measure the components by using an auxiliary field T sub B, the value of which is determined by the current intensity in the magnetic rings used to create the field, and the direction of which is opposite to that of the component being measured. The procedure is described and examples are given to illustrate its use under actual conditions. D.L.G.

N74-13077 Joint Publications Research Service, Arlington, Va.
TEMPERATURE COMPENSATION OF QUARTZ GRAVIMETERS c14
A. P. Buketov *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 25-29 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 27-31 (For availability see N74-13074 04-13)

A means for improving the performance of quartz gravimeters is considered, which involves the temperature compensation of sensitive systems in a variable thermal field. It is pointed out that the mainspring of the gravimeter's sensitive system reacts to a change in the temperature of the material of which it is made, but that this effect can be eliminated by using a compensating element. Since the compensator and the mainspring are made of different materials, their different temperature conductivities cause them to react differently to a change in temperature. The equations governing the reactions to temperature change are given. An analysis indicates that the performance of existing quartz gravimeters can be increased if their system is thermostatically controlled in such a way that the harmonics with 50-hour periods have an amplitude of no more than 0.1 C inside the gravimeter, while those with periods of less than 50 hours are suppressed. D.L.G.

N74-13078 Joint Publications Research Service, Arlington, Va.
A LASER SEISMIC STATION c11
V. M. Klementyev and S. V. Potapyev *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 30-33 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 67-69 (For availability see N74-13074 04-13)

A seismic station design is presented which utilizes a special optical angle reflector that vibrates along with the ground. The reflector's movements are transmitted to a laser unit by means of a reflected beam. The laser unit, which is located 500 to 1000 meters away from the vibration recording points, converts the mechanical vibrations into electrical oscillations. When the beam-angle reflector combination is used, it becomes possible to determine the characteristics of the elastic waves, while completely eliminating the use of conducting wires. The seismic station records the longitudinal component of ground displacements, and can also be used to determine the vibrations' transversal components on the basis of the amplitudinal effects. Author

N74-13079 Joint Publications Research Service, Arlington, Va.
A TRANSISTORIZED SEISMIC SIGNAL AMPLIFIER c14
Sun Shun-I *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 34-38 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 70-73 (For availability see N74-13074 04-13)

The relative positioning was investigated of the filters and ARU (automtic gain or level control) in seismic signal amplifiers. A transistorized amplifier was constructed in which a special switch is utilized to cut the ARU system in, in front of the filters. In order to reduce the nonlinear distortions in the ARU system, during an instantaneous increase in the signal, a component emitter follower is used as an amplifier stage. An additional amplifying stage is included in the ARU's control circuit. During tests of the device, it was shown that when the ARU-filter engagement sequence is used, the amplifier's efficiency is higher than when the filter-ARU sequence is used. D.L.G.

N74-13080# Joint Publications Research Service, Arlington, Va.
OPTICS OF THE OCEAN AND THE ATMOSPHERE
19 Nov. 1973 27 p Transl. into ENGLISH from Opt. Okeana i Atm. (USSR), 1972
(JPRS-60572) Avail: NTIS HC $3.50

The optical properties of the ocean were investigated. The subjects discussed are: (1) scattering of pulses from a pencil beam in sea water, (2) distortion of laser light pulses during propagation in the sea, and (3) fluctuations of underwater irradiance. For individual titles, see N74-13081 through N74-13083.

N74-13081 Joint Publications Research Service, Arlington, Va.
SCATTERING OF THE DELTA-PULSE FROM A PENCIL BEAM IN THE SEA
A. M. Gurfink and B. A. Kargin *In its* Optics of the Ocean and the Atmosphere (JPRS-60572) 19 Nov. 1973 p 1-10 refs Transl. into ENGLISH from Opt. Okeana i Atm. (USSR), 1972 p 62-70 (For availability see N74-13080 04-13)

A considerable number of theoretical and experimental works have recently appeared in which studies have been made of the laws of light fields arising during the illumination of scattering and absorbing media by short narrowly directed signals. However, with reference to specific conditions of sea water that question remains open. The scattering of sigma-pulses from a narrowly directed radiation source in the sea is investigated, the main attention being given to the time and angular structure of the light field. Author

N74-13082 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF DISTORTION OF A LASER LIGHT PULSE DURING PROPAGATION IN THE SEA c16
I. I. Kalinin, V. N. Pelevin, A. L. Skrelin, and D. M. Sherbaf *In its* Optics of the Ocean and the Atmosphere (JPRS-60572) 19 Nov. 1973 p 11-17 refs Transl. into ENGLISH from Opt. Okeana i Atm. (USSR), 1972 p 168-174 (For availability see N74-13080 04-13)

An analysis of the distortion of a laser light pulse during propagation sea water was conducted. The main tasks of the experiment were: (1) elaboration of a procedure for the use of lasers and receivers with high time resolution to investigate processes of light scattering in the sea, and (2) obtaining a picture of the time spreading of a light pulse in sea water as a function of the distance between the emitter and the receiver. The equipment used in the tests is described and the methods for deriving the information are discussed. Author

N74-13083 Joint Publications Research Service, Arlington, Va.
STUDY OF FLUCTUATIONS OF UNDERWATER IRRADIANCE
K. S. Shifrin, V. N. Pelevin, and A. I. Sudbin *In its* Optics of the Ocean and the Atmosphere (JPRS-60572) 19 Nov. 1973

p 18-25 refs Transl. into ENGLISH from Opt. Okeana i Atm. (USSR), 1972 p 174-181 (For availability see N74-13080 04-13)

A method of measuring fluctuations of underwater irradiance to a depth of 200 to 300 meters is described. Some data obtained in the open area of the Pacific Ocean are presented. The variation coefficient was found to decrease with depth. Spectra of irradiance fluctuations were calculated. The spectrum intensity was shown to decrease for frequencies above one Hz. Author

N74-13084# Illinois Univ., Urbana. Ionosphere Radio Lab.
STUDY OF THE RESPONSE OF THE IONOSPHERIC F-REGION TO MAGNETIC STORMS
Allen L. Hearn Aug. 1973 106 p refs
(Grant NSF GA-13723)
(UILU-ENG-73-2553; TR-51) Avail: NTIS HC $7.50

The literature concerning the response of the ionosphere to magnetic storms is reviewed. Particular attention is given to effects of an increased magnetospheric convection electric field on the ionosphere. The equation of continuity for ionization, the equation of motion for ions, and an approximate equation of motion for the neutrals are solved numerically with the effects of the convection electric field included. The results of these calculations show that an increased convection electric field is a good mechanism for explaining the large dusk sector increases in total electron content and maximum electron density. Total electron content data from eleven locations for the sudden commencement type storms of 1969 are also examined. From these data a longitudinal effect in both storm time and local time behavior of total content is observed. None of the presently existing theories are capable of explaining this effect. Author

N74-13085# TRW Systems Group, Redondo Beach, Calif.
CHARACTERISTICS OF MAGNETOSPHERIC SUBSTORMS AND THEIR EFFECTS UPON SPACECRAFT: A SELECTED BIBLIOGRAPHY
W. R. LeJeune, comp. and L. R. Magnolia, comp. Oct. 1973 44 p refs
Avail: NTIS HC $4.25

A bibliography of reports on magnetospheric substorms and their effects on unmanned spacecraft is presented. The material provides a description of the substorm environment and emphasizes the consequences on synchronous satellites. A correlation of simultaneous space events with magnetospheric substorms was established. More than 140 abstracts are included in the report. Author

N74-13086*# General Research Corp., Arlington, Va.
EOS IMAGE DATA PROCESSING SYSTEM DEFINITION STUDY Final Technical Report, May - Aug. 1973
J. Gilbert, T. Honikman, E. McMahon, E. Miller, L. Pietrzak, and W. Yorsz Oct. 1973 118 p refs
(Contract NAS5-21950)
(NASA-CR-132892; CR-1-457; WGRC-73-3297) Avail: NTIS HC $8.00

The Image Processing System (IPS) requirements and configuration are defined for NASA-sponsored advanced technology Earth Observatory System (EOS). The scope included investigation and definition of IPS operational, functional, and product requirements considering overall system constraints and interfaces (sensor, etc.) The scope also included investigation of the technical feasibility and definition of a point design reflecting system requirements. The design phase required a survey of present and projected technology related to general and special-purpose processors, high-density digital tape recorders, and image recorders. Author

N74-13087# Translation Consultants, Ltd., Arlington, Va.
STUDY OF THE POLYCYCLIC HYDROCARBONS IN THE ATMOSPHERE. 2: A COMBINATION OF GASEOUS-PHASE CHROMATOGRAPHY AND THIN-LAYER CHROMATOGRAPHY FOR THE DETECTION OF POLYNUCLEAR PARTICLES
G. Chatot, R. Dangy-Caye, and R. Fontanges 1973 11 p refs Transl. into ENGLISH from J. Chromatogr. (Netherlands), v. 72, 1972 p 202-206 Sponsored by EPA
(TR-376-73) Avail: NTIS HC $3.00

An analysis of the polycyclic hydrocarbons found in the earth atmosphere is described. The application of gaseous-phase chromatography for the systematic identification of pollutants in the atmosphere is recommended. A table is included to show the types of hydrocarbons, the retention temperature, and the weight in micrograms per gram of dust. Author

N74-13088*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH LATITUDE IONOSPHERIC WINDS RELATED TO SOLAR-INTERPLANETARY CONDITIONS
J. P. Heppner Nov. 1973 13 p refs Presented at Symp. of Possible Relationships Between Solar Activity and Meteorol. Phenomena, Greenbelt, Md., 7-8 Nov. 1973
(NASA-TM-X-70530; X-645-73-354) Avail: NTIS HC $3.00 CSCL 04A

Treated jointly, two recent results imply that the distribution of winds in the polar ionosphere should change as a function of the direction of the interplanetary magnetic field. (1) From the motions of chemically released ion and neutral clouds, it is apparent that neutral winds in the high latitude ionosphere are driven principally by ion drag forces. (2) OGO-6 electric field measurements have demonstrated that there are definite relationships between the time-latitude distribution of ionospheric plasma convection and interplanetary magnetic field parameters, and also that the distribution is most sensitive to the azimuthal angle of the interplanetary field. Although direct neutral wind to interplanetary magnetic field comparisons are not available, logic clearly implies a close relationship. The lower altitude, meteorological effects of these externally driven ionospheric winds are not known. However, observations of infrasonic waves following sudden ionization enhancements indicate the existence of momentum transfer. Author

N74-13089*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSES FOR PRECISION REDUCED OPTICAL OBSERVATIONS FROM THE INTERNATIONAL SATELLITE GEODESY EXPERIMENT (ISAGEX)
J. G. Marsh, B. C. Douglas (Wolf R and D Corp., Riverdale, Md.), and S. M. Klosko (Wolf R and D Corp., Riverdale, Md.) Nov. 1973 23 p refs Presented at 24th intern. Astronaut. Congr., Baku, 8-15 Oct. 1973
(NASA-TM-X-70528; X-590-73-340) Avail: NTIS HC $3.25 CSCL 08E

During the time period of December 1970 to September 1971 an International Satellite Geodesy Experiment (ISAGEX) was conducted. Over fifty optical and laser tracking stations participated in the data gathering portion of this experiment. Data from some of the stations had not been previously available for dynamical orbit computations. With the recent availability of new data from the Astrosoviet, East European and other optical stations, orbital analses were conducted to insure compatibility with the previously available laser data. These data have also been analyzed using dynamical orbital techniques for the estimation of estimation of geocentric coordinates for six camera stations (for Astrosoviet, two East European). Thirteen arcs of GEOS-1 and 2 observations between two and four days in length were used. The uncertainty in these new station values is considered to be about 20 meters in each coordinate. Adjustments to the previously available values were generally a few hundred meters. With these geocentric coordinates these data will now be used to supplement earth physics investigations during the ISAGEX. Author

N74-13090*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POLAR SEA ICE OBSERVATIONS BY MEANS OF MICROWAVE RADIOMETRY
P. Gloersen, T. C. Chang, T. T. Wilheit, and W. J. Campbell (Geol. Surv., Tacoma) Nov. 1973 12 p refs Presented at Interdisciplinary Symp. on Advanced Concepts and Techniques in the Study of Snow and Ice Resources
(NASA-TM-X-70529; X-652-73-341) Avail: NTIS HC $3.00 CSCL 08L

Principles pertinent to the utilization of 1.55 cm wavelength radiation emanating from the surface of the earth for studying the changing characteristics of polar sea ice are briefly reviewed. Recent data obtained at that wavelength with an imaging radiometer on-board the Nimbus 5 satellite are used to illustrate how the seasonal changes in extent of sea ice in both polar

regions may be monitored free of atmospheric interference. Within a season, changes in the compactness of the sea ice are also observed from the satellite. Some substantial areas of the Arctic sea ice canopy identified as first-year ice in the past winter were observed not to melt this summer, a graphic illustration of the eventual formation of multiyear ice in the Arctic. Finally, the microwave emissivity of some of the multiyear ice areas near the North Pole was found to increase significantly in the summer, probably due to liquid water content in the firm layer. Author

N74-13091*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HISTORY OF SAN MARCO
Anthony J. Caporale Dec. 1968 76 p refs
(NASA-TM-X-70523; X-724-70-19) Avail: NTIS HC $6.00 CSCL 04A

A brief history is reported of the first San Marco project, a joint program of the United States and Italy. The Project was a three phase effort to investigate upper air density and associated ionosphere phenomena. The initial phase included the design and development of the spacecraft, the experiments, the launch complex, and a series of suborbital flights, from Wallops Island. The second phase, consisting of designing, fabricating, and testing a spacecraft for the first orbital mission, culminated in an orbital launch also from Wallops Island. The third phase consisted of further refining the experiments and spacecraft instrumentation and of establishing a full-bore scout complex in Kenya. The launch of San Marco B, in April 1967, from this complex into an equatorial orbit, concluded the initial San Marco effort.
Author

N74-13092*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FIELD ALIGNED CURRENT OBSERVATIONS IN THE POLAR CUSP IONOSPHERE
B. G. Ledley and W. H. Farthing Nov. 1973 30 p refs Submitted for publication
(NASA-TM-X-70534; X-645-73-364) Avail: NTIS HC $3.50 CSCL 03B

Vector magnetic field measurements made during a sounding rocket flight in the polar cusp ionosphere show field fluctuations in the lower F-region which are interpreted as being caused by the payload's passage through a structured field aligned current system. The field aligned currents have a characteristic horizontal scale size of one kilometer. Analysis of one large field fluctuation gives a current density of 0.0001 amp/m sq. Author

N74-13093*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUANTITATIVE MAGNETOSPHERIC MODELS DERIVED FROM SPACECRAFT MAGNETOMETER DATA
Gilbert D. Mead and Donald H. Fairfield Nov. 1973 56 p refs Submitted for publication
(NASA-TM-X-70533; X-641-73-363) Avail: NTIS HC $5.00 CSCL 03B

Quantitative models of the external magnetospheric field were derived by making least-squares fits to magnetic field measurements from four IMP satellites. The data were fit to a power series expansion in the solar magnetic coordinates and the solar wind-dipole tilt angle, and thus the models contain the effects of seasonal north-south asymmetries. The expansions are divergence-free, but unlike the usual scalar potential expansions, the models contain a nonzero curl representing currents distributed within the magnetosphere. Characteristics of four models are presented, representing different degrees of magnetic disturbance as determined by the range of Kp values. The latitude at the earth separating open polar cap field lines from field lines closing on the dayside is about 5 deg lower than that determined by previous theoretically-derived models. At times of high Kp, additional high latitude field lines are drawn back into the tail.
Author

N74-13094# Scientific Translation Service, Santa Barbara, Calif.
THE SPECTRAL TRANSPARENCY OF THE ANTARCTIC ATMOSPHERE. PART 1: INSTRUMENTS AND METHODS OF COMPUTATION
Michael Kuhm [1973] 52 p refs Transl. into ENGLISH from Arch. Meteorol., Geophys. Bioklimatol, Ser. B (Vienna), v. 20, 1972 p 207-248 Sponsored by EPA
(TR-590-73-Pt-1; APTIC-46894-Pt-1) Avail: NTIS HC $4.75

During the summers 1966-1967 through 1967-1968, the intensity of direct solar radiation was measured in five spectral bands on the central east Antarctic plateau (79 deg 15' S, 40 deg 30' E, elevation 3625 m above sea level). Intercomparisons of three pyrheliometers (a Linke-Feussner actinometer and one each Eppley pyrheliometer of old and new design, respectively) are evaluated with respect to their different angular apertures. The thermal properties of the instruments are considered theoretically and are also derived from both field experiments and laboratory tests. The laws of atmospheric turbidity are incorporated into a computer program that numerically integrates the solar spectrum, filter transmission (OG 1, RG 2, RG 8, Schott quartz filters and UV filter), and all processes of extinction. Recent measurements of the extraterrestrial spectrum of solar radiation are discussed. Author

N74-13095# Translation Consultants, Ltd., Arlington, Va.
THE PHOTOCHEMICAL THEORY OF ATMOSPHERIC OZONE
G. P. Gushchin [1973] 51 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Obs. (Leningrad), no. 279, 1972 p 94-127 Sponsored by EPA
(TR-609-73; APTIC-47709) Avail: NTIS HC $4.75 CSCL 03A

Theoretical and calculated ozone distributions in the atmosphere are analyzed. The causes of ozone distribution and atmospheric chemistry differences are also discussed. E.H.W.

N74-13096# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
ON THE STRUCTURE OF PLANETARY WAVES IN THE AURORAL REGION UPPER ATMOSPHERE
Y. T. Chiu and J. M. Straus 1 Nov. 1973 38 p refs
(ATR-74(9440-03)-1) Avail: NTIS HC $4.00

Satellite observations of the planetary scale variations of auroral forms and direct satellite observation of polar upper atmospheric winds during magnetic storms are discussed. The data indicate that substorms may be a source of planetary waves of frequency intermediate between the Rossby and acoustic-gravity regimes. The zonal wave number is approximately 3 to 6 and their propagation is strongly affected by the Coriolis forces. Interpretation of world wide traveling ionospheric disturbances in terms of meridional propagation of these waves is analyzed.
Author

N74-13097*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETOSPHERIC MAPPING WITH QUANTITATIVE GEOMAGNETIC FIELD MODELS
Donald H. Fairfield and Gilbert D. Mead Dec. 1973 37 p refs
(NASA-TM-X-70542; X-690-73-366) Avail: NTIS HC $4.00 CSCL 04A

The Mead-Fairfield geomagnetic field models were used to trace field lines between the outer magnetosphere and the earth's surface. The results are presented in terms of ground latitude and local time contours projected to the equatorial plane and into the geomagnetic tail. With these contours various observations can be mapped along field lines between high and low altitudes. Low altitudes observations of the polar cap boundary, the polar cusp, the energetic electron trapping boundary and the sunward convection region are projected to the equatorial plane and compared with the results of the model and with each other. The results provide quantitative support to the earlier suggestions that the trapping boundary is associated with the last closed field line in the sunward hemisphere, the polar cusp is associated with the region of the last closed field line, and the polar cap projects to the geomagnetic tail and has a low latitude boundary corresponding to the last closed field line. Author

N74-13098*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVOLUTION OF THE EARTH'S CRUST: EVIDENCE FROM COMPARATIVE PLANETOLOGY
Paul D. Lowman, Jr. Oct. 1973 80 p refs Submitted for

publication
(NASA-TM-X-70539; X-644-73-342) Avail: NTIS HC $6.00 CSCL 08E

Geochemical data and orbital photography from Apollo, Mariner, and Venera missions were combined with terrestrial geologic evidence to study the problem of why the earth has two contrasting types of crust (oceanic and continental). The following outline of terrestrial crustal evolution is proposed. A global crust of intermediate to acidic composition, high in aluminum, was formed by igneous processes early in the earth's history; portions survive in some shield areas as granitic and anorthositic gneisses. This crust was fractured by major impacts and tectonic processes, followed by basaltic eruptions analogous to the lunar maria and the smooth plains of the north hemisphere of Mars. Seafloor spreading and subduction ensued, during which portions of the early continental crust and sediments derived therefrom were thrust under the remaining continental crust. The process is exemplified today in regions such as the Andes/Peru-Chile trench system. Underplating may have been roughly concentric, and the higher radioactive element content of the underplated sialic material could thus eventually cause concentric zones of regional metamorphism and magmatism.
Author

N74-13099# Lockheed Missiles and Space Co., Palo Alto, Calif.
AURORAL ELECTRONS AND THE MAGNETIC SUBSTORM OF 12 DECEMBER 1968
Iu. G. Turbin, L. L. Vanian, Iu. L. Galperin, A. S. Debabov, V. A. Spivak, and N. I. Fedorova [1973] 7 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 13, no. 4, 1973 p 716-722
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

On the basis of electron flux measurements during the Kosmos-261 passage over the region of the auroral electrojet, the magnetic perturbation caused by the electrical current produced by the auroral electrons is estimated. A model of current influx and efflux in the ionosphere is taken in the form of two layers shifted relative to each other along the meridian. The estimate yields an approximately 30 gauss magnitude of the magnetic perturbation while delta > 300 gauss has been observed on earth.
Author

N74-13100# Finnish Meteorological Inst., Helsinki.
OBSERVATIONS OF RADIOACTIVITY, NO. 12, 1972
1973 68 p
(ISBN-951-697-016-8) Avail: NTIS HC $5.50

Observations of radioactivity in Finland for 1972 are presented. Hourly values are given for the fractions of aerosol beta activity decaying within four hours of the end of a four hour sampling period. The fraction of aerosol beta activity remaining four days after the end of the sampling period are shown by daily and weekly activities. Beta activity in precipitation is also included.
K.M.M.

N74-13101*# Michigan State Univ., East Lansing.
THE USE OF COLOR INFRARED PHOTOGRAPHY FOR WETLANDS MAPPING WITH SPECIAL REFERENCE TO SHORELINE AND WATERFOWL HABITAT ASSESSMENT
Project for the Use of Remote Sensing in Land Use Policy Formulation
Oct. 1973 36 p refs
(Grant NGL-23-004-083)
(NASA-CR-136271) Avail: NTIS HC $4.00 CSCL 08B

Evaluation of low altitude oblique photography obtained by hand-held cameras was useful in determining specifications of operational mission requirements for conventional smaller-scaled vertical photography. Remote sensing techniques were used to assess the rapid destruction of marsh areas at Pointe Mouillee. In an estuarian environment where shoreline features change yearly, there is a need for revision in existing area maps. A land cover inventory, mapped from aerial photography, provided essential data necessary for determining adjacent lands suitable for marshland development. To quantitatively assess the wetlands environment, a detailed inventory of vegetative communities (19 categories) was made using color infrared photography and intensive ground truth. A carefully selected and well laid-out transect was found to be a key asset to photointerpretation and to the analysis of vegetative conditions. Transect data provided the interpreter with locally representative areas of various vegetative types. This facilitated development of a photointerpretation key. Additional information on vegetative conditions in the area was also obtained by evaluating the transect data.
Author

N74-13102*# Wisconsin Univ., Madison. Inst. for Environmental Studies.
ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS Progress Report, 1972 - 1973
James L. Clapp 1973 77 p Original contains color illustrations
(Grant NGL-50-002-127)
(NASA-CR-136280) Avail: NTIS HC $6.00 CSCL 08H

Research objectives during 1972-73 were to: (1) Ascertain the extent to which special aerial photography can be operationally used in monitoring water pollution parameters. (2) Ascertain the effectiveness of remote sensing in the investigation of nearshore mixing and coastal entrapment in large water bodies. (3) Develop an explicit relationship of the extent of the mixing zone in terms of the outfall, effluent and water body characteristics. (4) Develop and demonstrate the use of the remote sensing method as an effective legal implement through which administrative agencies and courts can not only investigate possible pollution sources but also legally prove the source of water pollution. (5) Evaluate the field potential of remote sensing techniques in monitoring algal blooms and aquatic macrophytes, and the use of these as indicators of lake eutrophication level. (6) Develop a remote sensing technique for the determination of the location and extent of hydrologically active source areas in a watershed.
Author

N74-13103# Research Inst. of National Defence, Stockholm (Sweden).
CONFERENCES ON REMOTE SENSING AND USA
F. Eklund and H. Ottersten Oct. 1971 56 p refs Symp. on Remote Sensing of the Atmosphere from Aircraft, held at Denver, 28-30 Apr. 1970; 7th Intern. Symp. on Remote Sensing of Environment, held at Ann Arbor, Mich., 17-21 May 1971; and Conf. on Propagation Limitations in Remote Sensing, held at Colorado Springs, 21-25 Jun. 1971
(FOA-3-C-3689-E1) Avail: NTIS HC $5.00

Comments are reported concerning three conferences on remote sensing. These conferences are (1) symposium on remote sensing of the atmosphere from aircraft, (2) seventh international symposium on remote sensing of the environment, and (3) propagation limitations in remote sensing.
F.O.S.

N74-13104# California Univ., Livermore. Lawrence Livermore Lab.
MAGNETIC INDUCTION: A SYSTEM FOR WIRELESS DOWNHOLE COMMUNICATION IN CASED HOLES
P. W. Rodgers 25 May 1973 17 p refs
(Contract W-7405-eng-48)
(UCRL-51396) Avail: NTIS HC $4.00

The sequential detonation of a series of nuclear explosives in the same drill hole requires some type of alternate cableless communication for command and control because of the possibility that the primary cable link may be destroyed by the initial detonation. Communication by both seismic and electromagnetic (EM) propagation is possible. An EM method, selected because of the likelihood of a large but unspecified seismic background noise following the initial detonation that might interfere with seismic communication, is described. The system consists of a large horizontal surface loop driven at a low frequency, and a vertical many-turn downhole receiving coil. The downhole coil senses the low-frequency induction field produced by the surface loop. The attenuation due to the conducting rocks and the attenuation through the steel well casing is accounted for theoretically and measured experimentally. A field experiment is described which verifies the theory and practicality of the method.
Author (NSA)

N74-13105# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
NUCLEAR ANALYSIS IN GEOLOGY AND GEOCHEMISTRY: A BIBLIOGRAPHY

E. A. Newland, comp. Mar. 1973 117 p refs
(AAEC/LIB/Bib-378) Avail: AEC Depository Libraries $8.00

A bibliography is presented containing 511 references covering the period 1967-1972 from Geophysics Abstracts and NSA. Arrangement is alphabetical by author within each year and is divided into general references and references on borehole logging. A citation of an abstract for each reference is given. Author (NSA)

N74-13106# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.

THEORETICAL AND EXPERIMENTAL CONSIDERATIONS BEHIND BALLOON-BORNE ELECTRIC FIELD EXPERIMENTS

R. Bostroem and U. Fahleson Sep. 1973 29 p refs Presented at the Symp. on European Sounding Rocket and Related Res. at High Latitudes, Spaatind, Norway, 1973
(TRITA-EPP-73-14) Avail: NTIS HC $3.50

Balloon-borne measurements of electric fields of ionospheric origin are very useful as a complement to rocket and satellite measurements because they make possible the study of long term variations. The penetration of ionospheric electric fields to balloon altitudes is reviewed. It was concluded that large scale components of the horizontal ionospheric fields can be measured at altitudes of 30-40 km. It is difficult, however to study ionospheric field variations at frequencies higher than about 0.1 Hz or to resolve spatial structures smaller than about 100 km. Technical problems associated with double probe measurements at these altitudes are discussed. The usefulness of the method is demonstrated by reviewing some results of previous measurements. Author (ESRO)

N74-13107# Institut Royal Meteorologique de Belgique, Brussels.

GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Jun. 1973 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, JUIN 1973]

Jun. 1973 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.50

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during June 1973 are presented. ESRO

N74-13108# Institute of Geological Sciences, Hailsham (England). Geophysical Div.

USER MANUAL AND CATALOGUE FOR MACHINE-READABLE DATA

Marion P. Fisher and D. R. Barraclough [1972] 24 p
(Rept-16) Avail: NTIS HC $3.25

The organization of the Geomagnetic Data Center is described. This center collects observations from larger scale magnetic surveys and from the world wide network of geomagnetic observatories. The input format for punched cards, paper tape, and magnetic tape is specified. A catalog of annual means, 2.5 min scalings, one hourly values, and data per observation site, is presented. ESRO

N74-13109# Systems Control, Inc., Palo Alto, Calif.

ATMOSPHERIC MODEL SURVEY Final Report, 1 Feb. - 31 Aug. 1973

R. B. Schainker, J. E. Wirsching, R. W. Lau, J. W. Patmore, and R. P. Brennan Aug. 1973 222 p
(Contract N00014-73-C-0409)
(AD-767077; SCI-5101-1) Avail: NTIS CSCL 04/1

The report treats the subject of error variance analysis as an adjunct to the scientific content of the final reports and monographs of the Climatic Impact Assessment Program (CIAP). A survey of CIAP modelling efforts is presented and assembled in array format to illustrate the composite linkage of atmosperic mechanisms. Author (GRA)

N74-13110# Aerospace Corp., El Segundo, Calif.

THE INTERACTION OF A FINITE AMPLITUDE SURFACE WAVE WITH AN INTERNAL WAVE Technical Report, Oct. 1971 - Dec. 1972

James B. Fedele 17 Aug. 1973 51 p refs
(Contract F040701-73-C-0074)
(AD-766254; TR-0074(4643)-1; SAMSO-TR-73-271) Avail: NTIS CSCL 08/3

The conservation equation approach is used to describe the interaction of a large amplitude surface wave with a long wavelength internal wave disturbance, including the effect of surface tension. The character of the equations is found to be dependent on a slope parameter as well as a parameter describing the relative importance of surface tension and gravity, but is independent of the disturbance. Both elliptic and hyperbolic domains exist. The system is parabolic if finite amplitude effects are neglected. The initial value problem for a small disturbance for the more pertinent elliptic case produces exponential time growth. Oscillatory, rather than growing solutions, occur for the hyperbolic case. Linear and quadratic time growth occur for the nonresonant and resonant (C = (Cg sub 0)) small amplitude, initial-value problem. Finite amplitude effects remove the singularity present in the small amplitude case at C = (Cg sub 0). A steady-state solution is seen to be of limited usefulness. Viscosity severely damps capillary waves. Conditions for which viscous damping can overcome the growth are found for both the capillary and gravity wave cases. Author (GRA)

N74-13111# Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.

GRAVITY SURVEYS OF THE ARCTIC OCEAN BASIN Final Report

Richard J. Wold Jan. 1973 232 p refs
(Contract N00014-67-A-0128-0006; NR Proj. 307-316)
(AD-766979) Avail: NTIS CSCL 08/5

Gravity observations were conducted from ice-island ARLIS-11 from 1 July 1961 to 8 May 1965. In addition, over 800 air-lifted gravity stations were occupied during the period from 1960 through 1969. This data is described, plotted in profiles, contour maps drawn and detailed listings of all the gravity data are included. Author (GRA)

N74-13112# Ocean-Atmosphere Research Inst., Cambridge, Mass.

ON THE THERMAL LAG IN THE OCEAN DURING A PERIOD OF CLIMATIC CHANGE Annual Technical Report, 1 Jun. 1972 - 30 Jun. 1973

I. I. Schell and D. A. Corkum Aug. 1973 29 p refs
(Contract F44620-72-C-0040; ARPA Order 2159)
(AD-766956; OARI-1-73; AFOSR-73-1506TR) Avail: NTIS CSCL 08/10

An analysis was made of the sea surface temperatures in the northern North Atlantic, sea temperature in the 0-200 m layer along the Kola meridian (70 degrees E, approximately) between 70 degrees 30 min. and 72 degrees 30 min. N reflecting the inflow of relatively warm North Atlantic water into the Barents Sea, and the sea surface temperatures in the Western Mediterranean affected by storms crossing from the North Atlantic by the way of the Bay of Biscay, France and Spain and others which develop locally in wake of cold air outbreaks from the Continent; the ice off Iceland; and the air temperatures and pressures over the northern North Atlantic, Greenland, and Europe during the period 1921-50 and the following decades 1951-60 and 1961-70, with the objective of determining a possible lag in the ocean vis-a-vis the atmosphere during a period of climatic change. (Modified author abstract) GRA

N74-13113# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.

MARINE PHYSICAL LABORATORY DEEP TOW INSTRUMENTATION SYSTEM

Fred N. Spiess and Robert C. Tyce 1 Mar. 1973 43 p refs
(Contract N00014-69-A-0200-6002; Grants NSF GA-20014; NSF GA-31377X; NR Proj. 260-103)
(AD-766477; Sio-Ref-73-4; MPL-U-69/72) Avail: NTIS CSCL 08/10

A survey of the Marine Physical Laboratory deep tow instrumentation system is presented. Included are descriptions of the development and implementation of the hardware, instrumentation, and techniques involved in the use of this deep towed submersible instrument platform for oceanographic research. The system is equipped with up-, down-, forward-, and side-looking sonars, as well as low-frequency (rkHz) bottom penetrating sonar, proton precession magnetometer, precision

temperature probe, stereo cameras and strobe light, and snapshot television. Control information and data are telemetered along the supporting coaxial cable bilaterally between the fish near the bottom and the laboratory aboard ship. Precision navigation of both fish and ship is accomplished by means of a network of acoustic transponders. Since its initial usage in late 1964, the system has been in operation for over 10,000 hours in depths down to and exceeding 7000 meters. Author (GRA)

N74-13114# Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
ALASKAN ARCTIC COASTAL PROCESSES AND MORPHOLOGY Final Report, 1 May 1971 - 30 Jun. 1973
William J. Wiseman, Jr., James M. Coleman, Anthony Gregory, Shih-Ang Hsu, and Andrews D. Short Jul. 1973 184 p refs (Contract N00014-69-A-0211-0005; ARPA Order 1783; NR Proj. 388-110)
(AD-766475; TR-149) Avail: NTIS CSCL 08/3

A study of the temporal and spatial variability of the physical processes and environments of the Alaskan Arctic Coast was conducted over a 2-year period (May 1971 - June 1973). Micrometeorological studies demonstrated the difficulty of characterizing momentum transfer from air to ice by a single constant drag coefficient but indicated that such a coefficient may characterize air-sea momentum transfer in the nearshore waters. Summer wind-driven currents were far stronger and more variable than those during the winter season. They caused large meteorological tides and subsequent modification of the nearshore water mass characteristics. Statistically significant contrasts were noted between the morphology of the Chukchi and Beaufort coasts. The study demonstrated the dominance of storm-induced modification of the nearshore region and indicated that the arctic coastal coastal environment cannot be adequately characterized from short-term studies conducted during moderate conditions. (Modified author abstract) GRA

N74-13115# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON MARINE GEODESY: FROM MATERIALS OF THE GENERAL ASSEMBLEY OF THE IUSS (15TH)
B. M. Malakhov Jun. 1973 19 p Transl. into ENGLISH from Geodez. i Kartograf. (Moscow), no. 2, Feb. 1973 p 19-25
(AD-766762; DMAAC-TC-1956) Avail: NTIS CSCL 08/5

The paper discusses marine geodesy; namely, that part of geodesy which has the mission of studying methods of measurement in order to obtain the mutual positions of points at sea and the aqueous environment. It takes into consideration the methods for the processing of acquired measurements; examination of the problems of the determination of the earth's form and dimensions; studying the variations of the earth's figure and gravitational field associated with the influence of internal and external processes taking place in the earth and beyond its limits. Author (GRA)

N74-13116# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON COMPUTING THE CORRECTION FOR SEA-BOTTOM TOPOGRAPHY IN GRAVITY PROFILING SURVEYS
V. P. Melikhov, A. G. Gaynonov, and V. L. Panteleev Jun. 1973 14 p refs Transl. into ENGLISH from Morsk. Gravimetricheskiye Issled. (Moscow), no. 6, 1972 p 67-71
(AD-766550; DMAAC-TC-1949) Avail: NTIS CSCL 08/5

In the development of methods for computation of the correction for the sea-bottom topography, great difficulties associated with the characteristics of the type of gravimetric survey, and with the extent of information of topography are encountered. This paper discusses a priori information, i.e., that which was obtained from surveys carried out earlier, and the data which are obtained from direct echo sounding of the ocean floor in the process of profile traversing. A priori information could be a solution to the correction problem. Author (GRA)

N74-13117# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON THE REDUCTION OF GRAVITY AT SEA
B. K. Balavadze and P. Sh. Mindeli Jul. 1973 12 p refs Transl. into ENGLISH from Soobshch. Akad Nauk Gruzinsk. SSR (Tiflis), v. 68, no. 3, Dec. 1972 p 581-584
(AD-766551; DMAAC-TC-1952) Avail: NTIS CSCL 08/5

The problem of reduction of gravity for seas and oceans is investigated. The advisability of introducing a new-type hydrographic reduction is demonstrated. The scheme of gravity anomalies in the proposed new type of reduction is drawn and described in brief. The feasibility of using this anomaly in investigating the earth's crust is shown. Author (GRA)

N74-13118# National Oceanic and Atmospheric Administration, Rockville, Md.
THE PHYSICS OF AIR-SEA INTERACTION
S. A. Kitaigorodskii 1973 245 p refs Transl. into ENGLISH from mono. "Fizika Vzaimodeistviya Atmosfery i Okeana" (Leningrad), 1970 284 p Sponsored in part by NSF
(TT-72-50062) Avail: NTIS HC $5.75 CSCL 08C

The book deals with physical investigations of small-scale interaction between the ocean and atmosphere. Questions of heat exchange computation are treated in detail, up-to-date concepts about wave formation are discussed, the fundamentals of the theory and the computing procedure of wind-induced vertical mixing processes in the surface layer of the sea are described. Experimental data on the subject are analyzed and summarized. GRA

N74-13119# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
CONSTRUCTION AND CALIBRATION OF A NEUTRAL GAS SPECTROMETER WITH OPEN CATHODELESS ELECTRON-IMPACT ION SOURCE FOR DENSITY MEASUREMENTS IN THE UPPER ATMOSPHERE
H. Trinks 17 May 1973 42 p refs Transl. into ENGLISH of Physik. Inst. der Univ. Bonn Rept. BMBW-FB-W71-06
(AD-767188; AFCRL-TR-73-0319; AFCRL-Trans-103; BMBW-FBW-71-06) Avail: NTIS CSCL 07/4

Up to now, a reliable determination of the number density of atomic oxygen in the atmosphere by means of mass spectrometers has not been accomplished. Presumably, losses of O occur at the ion source walls and at the filament. Therefore, a mass spectrometer has been developed having an electron-impact ion source where the electrons are produced by a multiplier together with a UV lamp. To minimize the influence of impacts at the walls, the ion source was designed with a wide open geometry. The spectrometer was calibrated by means of a gas flow method with a gas flow of 50 liters/sec produced by a helium cooled cryopump. Neither oil nor mercury pumps were employed in the system. The calibration results are given, and the calculated mass discrimination curve is discussed and compared with that of a monopole spectrometer using an ion source with a hot filament. Author (GRA)

N74-13120# Georgia Inst. of Tech., Atlanta. Research Inst.
NEW TECHNIQUE AND INDICATORS FOR STUDIES OF GROWTH HISTORY OF ZONED CRYSTALS Final Report, 1 Nov. 1969 - 30 Sep. 1973
Charles O. Pollard, Jr. 31 Aug. 1973 88 p refs
(Contract DAHC04-70-C-0012; Grants DA-ARO(D)-31-124-71-G64; DA-ARO(D)-31-124-72-G41)
(AD-767437; GIT-A1409-8) Avail: NTIS CSCL 08/7

Two X-ray diffraction imaging techniques have been applied for the first time to the study of previously unnoted mosaic detail in color-zoned Brazilian tourmaline. The divergence source-image distortion (DSID) technique gives maximum values for misorientations among all observable grains, whereas the convergence source-image distortion (CSID) technique yields the magnitude of misorientation between adjacent grains. Strikingly abrupt textural changes are observed; they are always accompanied by color changes. The converse is not found to hold. The central or core region of all five plates studied shows a macromosaic texture. No grain elongation is observed. AT-cut quartz crystals can be made to Dauphine twin by torsion at above 600C, such that the twin boundaries assume veil-like shapes with steps, except where they correspond to pre-existing growth horizon boundaries. Strain rate controls and recording are needed to exclude problems with fracturing. Author (GRA)

N74-13121# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.
STRATIFIED SHEAR FLOWS OVER A SIMULATED THREE

DIMENSIONAL URBAN HEAT ISLAND
S. SethuRaman and J. E. Cermak Aug. 1973 209 p refs
(Contract N00014-68-A-0493-0001; NR Proj. 062-414; Proj. Themis)
(AD-767063; CER73-74SSJEC4; THEMIS-CER-TR-23) Avail: NTIS CSCL 04/1

Three-dimensional airflow over a rectangular heat island was studied for various conditions of approach flow in a wind tunnel. Three different thermal stratifications of the approach flow were selected for the study-neutral, ground based and elevated inversions. For each of these flows studies were conducted with and without roughness over the heat island and for the conditions with and without heating. Approach flow temperature profiles were modeled according to atmospheric data available in the literature. For each of the twelve cases mentioned above, measurements of mean wind velocity, longitudinal velocity fluctuations, mean temperature and temperature fluctuations were made. In addition, mean concentration measurements of a radio-active gas released from a two-dimensional, ground-level line source upwind of the heat island were made. Flow patterns were visualized for different cases with the help of a passive smoke source. Comparisons of data from the wind-tunnel measurements with the field data were made. The mechanisms of the heat island observed in the wind-tunnel for different stratified flows were very similar to those observed in the field. The urban heat island plume that passes aloft downwind causes an appreciable reverse flow onto the heat-island. The helical vortices at the edge of the heat island cause a reduction in the turbulence level resulting in high concentrations of the mass released from a continuous line source upwind of the heat island. (Modified author abstract) GRA

N74-13122# Texas A&M Research Foundation, College Station.
EXPERIMENTAL DEVELOPMENT OF THE PREDICTIVE RELATIONS FOR THE EDDY EXCHANGE COEFFICIENTS FOR MOMENTUM AND HEAT IN THE ATMOSPHERIC BOUNDARY LAYER
Paul A. Jensen Jul. 1973 106 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-767295; A/M-Ref-73-2-T; ECOM-0073-T-6-68) Avail: NTIS CSCL 04/2

Direct measurements of the eddy fluxes of momentum and heat were made in the atmospheric boundary layer simultaneously with measurements of the profiles of average wind velocity and temperature to evaluate the capability for functional definition of the eddy exchange coefficients in terms of the mean parameters. The eddy exchange coefficients for both momentum and heat, (K sub m) and (K sub h), respectively, were found to depend strongly on atmospheric stability, both increasing with instability. (K sub m) was found to increase with increasing wind velocity, while no such relation was noted for (K sub h). Thus, as expected, but contrary to many earlier investigations based on mean measurements alone, the assumption of constancy of (K sub m) and (K sub h) or their ratio is not substantiated. Several postulated functional forms for (K sub m) and (K sub h) were investigated and quantitatively assessed. Author (GRA)

N74-13123# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
SATELLITE DATA PROCESSING SYSTEMS Final Report, 1 Feb. 1970 - 31 Jan. 1973
Rene J. Marcou, Robert W. Fioretti, Marvin E. Stick, Paul N. Pruneau, and Edward N. Richards 28 Feb. 1973 130 p refs
(Contract F19628-70-C-0105)
(AD-767606; AFCRL-TR-73-0364) Avail: NTIS CSCL 04/1

The report summarizes the mathematical and data analyses performed in the solution of scientific satellite data problems and describes the design and development of the processing systems which implemented these analyses. The processing systems described range in complexity from the initial reduction of the DMS-1 satellite accelerometer data to the detailed systems used in the reduction of data from the Cannonball II and OV1-21 satellites. A brief description of each satellite and its data processing requirements are given as an introduction to each system. The processing systems are in turn divided into sections by experiment type and output configuration. Many of the results described herein were incorporated by analysts and experimenters into presentations given at scientific meetings. Author (GRA)

N74-13124# University Coll., London (England). Dept. of Physics and Astronomy.
DETERMINATION OF AIR DENSITY, TEMPERATURE AND WINDS AT HIGH ALTITUDE Interim Report, 1 Feb. 1972 - 31 Jan. 1973
Gerald V. Groves and David Rees Mar. 1973 20 p refs
(Grant AF-AFOSR-2264-72; AF Proj. 8605)
(AD-767396; AFCRL-TR-73-0419; SR-1) Avail: NTIS CSCL 04/1

The report reviews the research carried out at University College London in the following areas: The development and comparison of techniques for extending and improving wind and temperature measurement; winds and temperatures in the high-latitude and equatorial thermosphere; and, atmospheric circulation. (Modified author abstract) GRA

N74-13125# Ghana Univ., Legon. Dept. of Physics.
IONOSPHERIC RESEARCH USING SATELLITES: THE EQUATORIAL FARADAY EVENING MINIMUM Interim Scientific Report, 1 Jan. - 31 Dec. 1972
John R. Koster 1 Feb. 1973 64 p refs
(Grant AF-AFOSR-2258-72)
(AD-767303; AFCRL-73-0546TR) Avail: NTIS CSCL 04/1

A deep daily minimum in total electron content occurs a few hours after local sunset at Legon on most days during eight months of the year. This minimum can be explained in terms of an elliptical motion of ionization in the vertical E-W plane over the equator. It is suggested that the motion is caused by an electrostatic field, mapped into the F region along field lines from the dynamo region. The field is thought to be due to an accumulation of negative charge in a band just east of the sunset line in the E region. The mechanism described by Carlson and Walker (1972) is suggested as the cause for the field. The electrostatic field and its accompanying elliptical circulation moves westward with the speed of the sunset line (490 m/s). A computer model based on this mechanism produces results comparable with those obtained experimentally. The production of irregularities giving rise to spread F and scintillation is closely associated with this elliptical circulation. Author (GRA)

N74-13126# Army Electronics Command, Fort Monmouth, N.J.
THE APPLICATION OF MINICOMPUTERS IN LASER ATMOSPHERIC EXPERIMENTS
Kenneth O. White, Gerald T. Wade, and S. A. Schleusener Sep. 1973 28 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-767528; ECOM-5510) Avail: NTIS CSCL 04/1

A minicomputer-based data acquisition and analysis system has been developed and applied to a variety of experiments involving the interactions between laser radiation and real and simulated atmospheres. This paper describes the system, its software and main applications. System features include signal analysis capability of both pulsed and continuous lasers, high data acquisition and computation rates, and real-time display of results. Basic system components include two minicomputers, four analog-to-digital converters, and a disc storage unit. One of the main applications of the system is as a dual parameter analyzer in experiments to determine the transmission of laser energy in controlled atmospheres. Efforts to complete these experiments were unsuccessful until minicomputer capability was added. The resulting real-time computation and display enabled real-time calibration and experiment monitoring. Minicomputer system application on other difficult experiments has also proven successful. Author (GRA)

N74-13127# Army Electronics Command, Fort Monmouth, N.J. 04/1
MEASUREMENT OF TOTAL OZONE AT WHITE SANDS MISSILE RANGE, NEW MEXICO
Jagir S. Randhawa Aug. 1973 29 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-767525; ECOM-5505) Avail: NTIS

A Dobson Spectrophotometer has been modified and set up at White Sands Missile Range, New Mexico (32 degrees 18 minutes N, 106 degrees 30 minutes W) to measure the total amount of ozone in a column of air extending from the ground to the top of the atmosphere. One year of data (1972) has been collected and analyzed. It indicates that the amount of ozone is maximum during the spring period (approximately 0.340 atm cm) and minimal in the fall (approximately 0.280 atm cm). Author (GRA)

N74-13128# TRW Systems Group, Redondo Beach, Calif.
MONTE CARLO SIMULATION OF ION COLLECTION BY A ROCKET-BORNE MASS SPECTROMETER FOR COLLISIONLESS AND TRANSITIONAL FLOWFIELDS Final Report, 1 Jan. - 30 Jun. 1973
Takashi Sugimura and Frank W. Vogenitz Jul. 1973 58 p refs
(Contract F19628-72-C-0130; AF Proj. 6687)
(AD-767419; TRW-20982-6002-TU-00; AFCRL-TR-73-0448)
Avail: NTIS CSCL 07/4

Monte Carlo calculations of ion collection by a rocket-borne mass spectrometer have been completed for the collisionless case for the following range of parameters: Debye number 0.01 to 1000, speed ratio 0.1 to 3.1 and nondimensional potential -10 to -200. Calculations made in the transition regime show that minimum altitude at which the free molecule flow assumption is valid is approximately 120 km. A calculation at 70 km corresponding to a Knudsen number 0.007 indicates that the flowfield can be characterized as near-continuum but one in which the rarefaction effects are still important. The study demonstrates that the Monte Carlo technique is an efficient method to determine ion collection over the complete range of the flight parameters: Knudsen number, Debye number, plate potential, and speed ratio. (Modified author abstract) GRA

N74-13530 International Geophysical Year World Data Center A, Asheville, N.C.
IONOSPHERE
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 489-585 refs (For availability see N74-13527 04-29)

N74-13532 International Geophysical Year World Data Center A, Asheville, N.C.
GEOMAGNETISM
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 685-782 refs (For availability see N74-13531 04-29)

N74-13533 International Geophysical Year World Data Center A, Asheville, N.C.
AERONOMY AND MISCELLANEOUS
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 783-812 refs (For availability see N74-13531 04-29)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-13129* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
THREE-AXIS ADJUSTABLE LOADING STRUCTURE Patent
Edward J. Lynch and Darwyn T. Gray, inventors (to NASA) Issued 4 Dec. 1973 7 p Filed 16 May 1972 Supersedes N73-30416 (11-21, p 2547)
(NASA-Case-FRC-10051-1; US-Patent-3,776,028;
US-Patent-Appl-SN-253725; US-Patent-Class-73-88R;
US-Patent-Class-254-93R) Avail: US Patent Office CSCL 14B

A three axis adjustable loading structure for testing the movable surfaces of aircraft by applying pressure, is described. The device has three electric drives where the wall angle, horizontal position, and vertical position of the test device can be rapidly and accurately positioned.
Official Gazette of the U.S. Patent Office

N74-13130* TRW, Inc., Redondo Beach, Calif.
METHOD OF AND DEVICE FOR DETERMINING THE CHARACTERISTICS AND FLUX DISTRIBUTION OF MICROMETEORITES Patent
Hans F. Meissinger, inventor (to NASA) Issued 14 Aug. 1973 7 p Filed 13 Jan. 1971 Sponsored by NASA
(NASA-Case-NPO-12127-1; US-Patent-3,752,996;
US-Patent-Appl-SN-106106; US-Patent-Class-250-219DF;
US-Patent-Class-250-83CD) Avail: US Patent Office CSCL 14B

A micrometeorite impact sensing method of and device for determining the characteristics and flux distribution of micrometeorites are discussed. The method consists of exposing to the micrometeorite environment, a panel of sheet material of a thickness to be punctured by impacting micrometeorites and then scanning the panel with a scanner which produces an output representing the number and size of the puncture holes in the panel. After, exposure, the panel is scanned for puncture holes by illuminating one side of the panel and retracting the panel into its stowage container past a photoelectric scanner which produces an output representing the incident light.
Official Gazette of the U.S. Patent Office

N74-13131* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VEE-NOTCHING DEVICE Patent
Raymond A. Spier, inventor (to NASA) Issued 11 Dec. 1973 5 p Filed 23 Sep. 1971 Supersedes N72-11372 (10 - 02, p 0198)
(NASA-Case-MFS-20730-1; US-Patent-3,777,605;
US-Patent-Appl-SN-182977; US-Patent-Class-83-452;
US-Patent-Class-83-602; US-Patent-Class-83-917;
US-Patent-Class-269-48.1) Avail: US Patent Office CSCL 14B

A device is described for forming vee-notches in tensile test specimens comprising a vertically reciprocating, triangular, triple-edged cutting tool guided in a corresponding triangular slot. The specimen to be vee-notched is mounted on a carriage that is movable toward and away from the cutting tool. The specimen is precisely positioned on the carriage by tapered studs that extend into holes in the specimen and are used to expand spring collets against the wall of the holes.
Official Gazette of the U.S. Patent Office

N74-13132* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYSTEM FOR CALIBRATING PRESSURE TRANSDUCER Patent
Garland N. Rollins, inventor (to NASA) Issued 11 Dec. 1973 8 p Filed 30 Mar. 1972 Supersedes N72-28462 (10 - 19, p 2564)
(NASA-Case-LAR-10910-1; US-Patent-3,777,546;
US-Patent-Appl-SN-239577; US-Patent-Class-73-4R;
US-Patent-Class-73-420) Avail: US Patent Office CSCL 14B

A system for calibrating a pressure transducer which has a reference portion and an active portion is reported. A miniature selector valve is positioned immediately adjacent the pressure transducer. A reference pressure, known pressure, and unknown pressure can be selectively admitted to the active side of the pressure transducer by the selector valve to enable calibration of the transducer. A valve admits pressure to the selector valve which has a piston and floating piston arrangement which allows proper selection with very small linear movement.
Official Gazette of the U.S. Patent Office

N74-13133 Arizona State Univ., Tempe.
WEAR METAL ANALYSIS BY PLASMA JET dc ARC SPECTROGRAPHY Ph.D. Thesis
Paul Michael McElfresh 1973 113 p
Avail: Univ. Microfilms Order No. 73-20440

A dc plasma jet fluid analyzer was used to analyze the

trace metal content in used lubrication oils using photographic detection. The plasma jet uses an all-He gas system to reduce background radiation, and also a force-feeding sample introduction technique to reduce viscosity variations of the oil samples. This emission method was found to have greater sensitivities and lower limits of detection than the rotating disk electrode technique. Samples of actual wear metal oils were analyzed and compared to their analyses as determined by Air force laboratories. The comparison was quite satisfactory for the elements Cr, Fe and Mg, but not for Al and Cu. Explanations are given for the discrepancies in the Al and Cu analyses. Generally, it was concluded that this new emission method could be improved significantly by switching to a photometric detection system, by using the latest and most stable metallo-organic standard solutions, and by using syringes of a more uniform and consistent diameter in the force-feeding sample injection system.
Dissert. Abstr.

N74-13134 Michigan State Univ., East Lansing.
A COMPUTER-INTERFACED FOURIER TRANSFORM SPECTROMETER WITH APPLICATIONS TO SOME ASPECTS OF SOLID STATE SPECTROSCOPY Ph.D. Thesis
Thomas Michael Niemczyk 1973 141 p
Avail: Univ. Microfilms Order No. 73-20385

A computer-interfaced Fourier transform spectrometer for use in the far-infrared has been constructed. Because of poor sources and detectors available, the far-infrared region is relatively inaccessible. Interferometric techniques possess several advantages over conventional dispersive methods, which are discussed with particular emphasis on the far-infrared. However, the experimental interferogram is the Fourier transform of the desired power spectrum, and a computer must be used to perform the necessary mathematical analysis. In order to minimize the time required for the data reduction, and to provide the additional advantages of automated control of the instrumental operating parameters, a commercial interferometer was interfaced to a PDP 8/I digital computer. The thesis is mainly concerned with the general considerations for interfacing experimental apparatus to a small laboratory computer, and the particular choices of hardware and software developed for the present application. The programs used to move the interferometer mirror, sample the data points, average and/or ratio the results, and transform the interferograms are described. Dissert. Abstr.

N74-13135 British Library Lending Div., Boston Spa (England).
PROBLEMS OF MEASURING LOW PRESSURES IN ISOTHERMAL AND NON-ISOTHERMAL VESSELS, 3
R. A. Haefer 3 Sep. 1973 14 p refs Transl. into ENGLISH from Vakuum-Tech. (West Ger.), v. 16, no. 9, 1967 p 210-215
(BLL-CE-Trans-5652-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The problems associated with pressure measurement in vessels of any desired temperature distribution, arrangement of gas sources and of pumping surfaces were described by methods of irreversible thermodynamics. A theory of molecular flow in vessels is briefly outlined and applied to the solution of a number of problems associated with pressure reading. Author

N74-13136 British Library Lending Div., Boston Spa (England).
METHOD OF CALCULATING THE AIR TIGHTNESS OF THE VACUUM SYSTEM IN A TURBINE WITH A WATER - JET EJECTOR
G. E. Efimochkin 3 Sep. 1973 9 p Transl. into ENGLISH from Elektr. Sta. (USSR), v. 41, no. 8, Aug. 1970 p 24-26
(BLL-CE-Trans-5646-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL Photocopy coupon

Leakage in many 300 MW sets reduces their efficiency by up to 2%. An account is presented of a method developed for checking the air tightness of the vacuum system in such sets. It is found to be simple, accurate and reliable and has yielded very favorable results at a number of power stations. The method is based on the introduction of an additional amount of air into the system through a calibrated nozzle. Author

N74-13137 British Library Lending Div., Boston Spa (England).
PHOTOMETRIC MEASUREMENTS USING IMAGE CONVERTERS
J. Bardes, C. Chancel, and P. Jourde 3 Sep. 1973 17 p refs Transl. into ENGLISH from Acta Electronica (France), v. 15, no. 4, 1972 p 251-356
(BLL-DRIC-Trans-3221-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A verification method is presented of those criteria controlling photometric measurements using image converters. A precise calibration of the converters allows the determination of a working range in which the method can be used. Although this range is very narrow for most of the existing converters, measurements on a wide range can be made using corrective factors drawn from calibration. Author

N74-13138 British Library Lending Div., Boston Spa (England).
MODEL RM-50 GC MASS SPECTROMETER EXCLUSIVELY USED FOR GAS CHROMATOGRAPHY-MASS SPECTROMETRY
E. Izumi Aug. 1973 25 p refs Transl. into ENGLISH from Hitachi Hyoron (Japan), v. 53, no. 12, 1971 p 71-75 (1205-1209)
(BLL-RTS-8022) Avail: British Library Lending Div., Boston Spa, Engl.: £2.40 or 8 BLL photocopy coupons

The development and characteristics of a mass spectrometer are discussed. The method for using the spectrometer to separate a multi-component sample into each of its constituents is described. The data handling system which is used with the spectrometer is explained. The mathematical model for expressing the resolution of a single converging-type mass spectrometer using a fan-shaped homogeneous magnetic field is expressed. Author

N74-13139 British Library Lending Div., Boston Spa (England).
NOTES ON AUGER ELECTRON SPECTROSCOPY
S. Komiua and K. Lyo Nov. 1973 26 p refs Transl. into ENGLISH from Shinku Kagaku (Tokyo), v. 15, 1972 p 35-46
(BLL-RTS-7849) Avail: British Library Lending Div., Boston Spa, Engl.: £2.50 or 8 BLL photocopy coupons

The application of Auger electron analysis techniques for determining the surface properties of materials is discussed. Auger peak voltages corresponding to various elements are arranged in semi-log graphs. By comparing obtained auger spectrum data with the graphs, the kind of elements present on the surface can be determined. The construction of the equipment and the method of operation are described. Samples of data for various materials and processes are presented. Author

N74-13140*# Santa Barbara Research Center, Goleta, Calif.
MARINER JUPITER/SATURN INFRARED INSTRUMENT STUDY Final Report
25 Jul. 1972 209 p refs Prepared for JPL
(Contract JPL-953304)
(NASA-CR-136196) Avail: NTIS HC $12.50 CSCL 14B

The Mariner Jupiter/Saturn infrared instrumentation conceptual design study was conducted to determine the physical and operational characteristics of the instruments needed to satisfy the experiment science requirements. The design of the instruments is based on using as many proven concepts as possible. Many design features are taken from current developments such as the Mariner, Pioneer 10, Viking Orbiter radiometers, and Nimbus D spectrometer. Calibration techniques and error analysis for the instrument system are discussed. Author

N74-13141# Joint Publications Research Service, Arlington, Va.
GYROSCOPIC INSTRUMENTS
Yu. A. Osokin 14 Nov. 1973 15 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (USSR), no. 7, 1973
(JPRS-60530) Avail: NTIS HC $3.00

The performance of gyroscopic instruments was tested. An investigation of the moments of stress in magnetic suspensions caused by geometric imprecisions was conducted. The imprecisions resulted from defects in the manufacture of floating

gyroscopic instruments. The results of the combined statistical processing of indications of a directional gyro and a magnetic compass are presented. For individual titles, see N74-13142 through N74-13143.

N74-13142 Joint Publications Research Service, Arlington, Va.
DRIFT MOMENTS IN MAGNETIC SUSPENSIONS OF GYROSCOPIC INSTRUMENTS
Yu A. Osokin and N. N. Stankevich *In its* Gyroscopic Instruments (JPRS-60530) 14 Nov. 1973 p 1-5 ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (USSR), no. 7, 1973 p 73-76 (For availability see N74-13141 04-14)

Questions connected with moments of stress in magnetic suspensions caused by geometric imprecisions in the manufacture of the rotor are examined. The moments of stress are analyzed for a rotor of arbitrary form. Author

N74-13143 Joint Publications Research Service, Arlington, Va.
COMBINED STATISTICAL PROCESSING OF INDICATIONS OF A DIRECTIONAL GYRO AND A MAGNETIC COMPASS
A. A. Ignatov, A. A. Zigumsov, and G. V. Tyumeneva *In its* Gyroscopic Instruments (JPRS-60530) 14 Nov. 1973 p 6-12 refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (USSR), no. 7, 1973 p 76-81 (For availability see N74-13141 04-14)

The results of investigation of the precision of course indication in a complex system containing a directional gyro and a magnetic compass, with use of a Kalman filter are discussed. A block diagram of the system is presented. An estimate is made of the influence of imprecision of knowledge of the statistical characteristics of errors of the directional gyro on the precision of the system. Author

N74-13144*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
SURFACE ELECTRICAL PROPERTIES EXPERIMENT, PART 1 Final Report
Walker S. Kupfer, comp. Oct. 1973 142 p refs
(Contract NAS9-11540; DSR Proj. 73070)
(NASA-CR-134162; CSR-TR-73-4-Pt-1) Avail: NTIS HC $9.25 CSCL 14B

The design evolution, hardware development, and production history of the surface electrical properties (SEP) experiment are discussed. The SEP transmitter and receiver were designed to be used on the lunar surface during the Apollo 17 mission. The equipment was used to measure lunar surface electrical properties over traverses totalling more than 8 kilometers, for a duration of more than 100 minutes. A comprehensive outline of the techniques, is given along with a simplified detailed breakdown of equipment description and function to outline the principles of operation. A history of the design evolution with trade-off criteria and emphasis on changes caused by decisions reached in solving problems inherent in a fast-paced development program are presented from the viewpoint of overall design concept and in detail for each item of deliverable hardware. There is a brief account of lunar operations. Author

N74-13145# Translation Consultants, Ltd., Arlington, Va.
THERMODYNAMIC PROCESSES IN A CONDENSATION NUCLEUS COUNTER
H. Israel and N. Nix 1973 5 p refs Transl. into ENGLISH from Z. Geophys. (West Germany), V. 32, 1966 p 175-177 Sponsored by EPA
(TR-399-73) Avail: NTIS HC $3.00

The thermodynamic processes inside a nucleus counter were investigated using high frequency response pickups. The study was aimed at determining whether or not the expansion process would cause a temperature decrease corresponding to that predicted by the basic adiabatic equation. According to the equation, a 15 C temperature decrease would correspond to the decrease of 160 mm Hg usually found in the nucleus counter. However, only a 6 C decrease was observed and this result remained the same even when the expansion velocity was increased substantially. It was concluded from the investigation that the temperature effect expected in a nucleaus counter, in accordance with the adiabatic equation, does not occur to the degree anticipated and is dependent upon the extent of reversibility of the process. D.L.G.

N74-13146*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PSEUDO-NOISE TEST SET FOR COMMUNICATION SYSTEM EVALUATION Patent Application
Gabriel R. Wallace, William E. Salter (Sperry Rand Corp.), Glenn D. Weathers (Sperry Rand Corp.), and Sidney S. Gussow, inventors (to NASA) (Sperry Rand Corp.) Filed 28 Nov. 1973 18 p
(Contract NAS8-21812)
(NASA-Case-MFS-22671-1; US-Patent-Appl-SN-419831) Avail: NTIS HC $3.00 CSCL 14B

A test set for communications systems is described. The set includes a pseudo-noise sequence generator that provides a test signal which is fed to a pair of signal channels. The first channel includes a spectrum shaping filter and a conditioning amplifier. The second channel includes a variable delay circuit, a spectrum shaping filter matched to the first filter, and an amplifier. The output of the first channel is applied to the system under test. The output of the system and the output of the second channel are compared to determine the degree of distortion suffered by the test signal due to the communications system. NASA

N74-13147*# Michigan State Univ., East Lansing.
IMAGE INTERPRETATION FOR A MULTILEVEL LAND USE CLASSIFICATION SYSTEM
Oct. 1973 37 p refs
(Grant NGL-23-004-083)
(NASA-CR-136264) Avail: NTIS HC $4.00 CSCL 08B

The potential use is discussed of three remote sensors for developing a four level land use classification system. Three types of imagery for photointerpretation are presented: ERTS-1 satellite imagery, high altitude photography, and medium altitude photography. Suggestions are given as to which remote sensors and imagery scales may be most effectively employed to provide data on specific types of land use. K.M.M.

N74-13148*# Michigan State Univ., East Lansing. Project for the Use of Remote Sensing in Land Use Policy Formulation.
USERS GUIDE TO HIGH ALTITUDE IMAGERY OF MICHIGAN
Apr. 1973 40 p
(Grant NGL-23-004-083)
(NASA-CR-136222) Avail: NTIS HC $4.00 CSCL 08B

A guide to the high altitude imagery of Michigan outlines the areas of the state covered by selected recent high altitude aircraft and Earth Resources Technology Satellite flights. The types of remote sensing used are described. Maps of the flight coverage areas are included along with price lists of available imagery. K.M.M.

N74-13149# Smithsonian Astrophysical Observatory, Cambridge, Mass.
OPTICAL AND MECHANICAL PERFORMANCE OF THE TILLINGHAST 60-INCH REFLECTOR, MOUNT HOPKINS OBSERVATORY
Rudolph E. Schild 14 Dec. 1973 34 p
(SAO-Special-Rept-355) Avail: NTIS HC $3.75

Optical performance of the Tillinghast 60-inch reflector was evaluated in several important areas. The image quality was found satisfactory and the optimum Cassegrain and coude focal planes were located. Periodic error in the telescope drive and mechanical and optical effects of tube flexure were satisfactorily small. An appendix lists many mechanical and optical properties of the telescope. Author

N74-13150# Translation Consultants, Ltd., Arlington, Va.
A PARTICLE DIAMETER DISTRIBUTION MEASUREMENT APPARATUS FOR SUSPENDED PARTICULATE MATTER
T. Kimoto [1973] 4 p Transl. into ENGLISH from the publ. "Proceedings of the 13th Symposium of the Japan Air Pollution Society" 1972 p 106 Sponsored by EPA
(TR-578-73; APTIC-48499) Avail: NTIS HC $3.00

The use of a cascade particulate separator to measure the weight of particles less than 10 microns suspended in the atmosphere is discussed. Data include particle distribution and grain components of the particles. E.H.W.

N74-13151*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
OPTICAL PROXIMITY SENSORS FOR MANIPULATORS
Alan R. Johnson 1 May 1973 20 p refs
(Contract NAS7-100)
(NASA-CR-136214; JPL-TM-33-612) Avail: NTIS HC $3.00 CSCL 14B

A breadboard optical proximity sensor intended for application to remotely operated manipulators has been constructed and evaluated in the laboratory. The sensing head was 20 mm x 15 mm x 10 mm in size, and could be made considerably smaller. Several such devices could be conveniently mounted on a manipulator hand, for example, to align the hand with an object. Type 1 and Type 2 optical configurations are discussed, Type 1 having a sharply defined sensitive volume, Type 2 an extended one. The sensitive volume can be placed at any distance between 1 cm and approximately 1 m by choice of a replaceable prism. The Type 1 lateral resolution was 0.5 mm on one axis and 5 mm perpendicular to it for a unit focused at 7.5 cm. The corresponding resolution in the axial direction was 2.4 cm, but improvement to 0.5 cm is possible. The effect of surface reflectivity is discussed and possible modes of application are suggested. Author

N74-13152*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A STUDY OF THE COMPATIBILITY OF SCIENCE INSTRUMENTS WITH THE SOLAR ELECTRIC PROPULSION SPACE VEHICLE
Richard H. Parker, Joseph M. Ajello, Alexander Bratenahl, Douglas R. Clay, and Bruce Tsurutani 15 Oct. 1973 138 p refs
(Contract NAS7-100)
(NASA-CR-136213; JPL-TM-33-641) Avail: NTIS HC $9.00 CSCL 14B

Electromagnetic interference and field-of-view constraints are identified as the areas of most concern to science on solar electric propulsion space vehicles. Several areas are indicated which more detailed data on the space vehicle environment are needed. In addition, possible means to attain or demonstrate science/space vehicle compatibility are recommended for further iteration between space vehicle design and science payload considerations. The space vehicle design developed by the solar electric propulsion system integration technology effort is used. Two payload sets for comet Encke missions (a slow flyby and a rendezvous), as well as several instruments which are not included in the two payload sets, are analyzed to determine requirements on the space vehicle imposed by the instruments in order to meet their objectives. Environmental requirements for the sets of instruments are developed and compared to both the SEPSIT design criteria and the environment as it is presently understood. Author

N74-13153# Lockheed Missiles and Space Co., Palo Alto, Calif.
SCIENTIFIC APPARATUS TO STUDY COSMIC RAYS PROGNOZ SATELLITES, 1
I. N. N. Volodichev, A. I. Vorobev, N. L. Grigorov, G. Ia. Kolesov, M. I. Kudriavtsev, O. B. Likin, V. N. Lutsenko, A. S. Melioranskii, E. I. Morozova, and N. I. Nazarova [1973] 6 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 13, no. 4, 1973 p 585-589
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The scientific equipment used for studying the charged particle fluxes on the Prognoz and Prognoz-2 satellites is described. The satellites are intended to study charged particle fluxes of solar and galactic origin, electromagnetic radiation in a broad range from the radio band to gamma radiation, the interplanetary magnetic field, and plasma. The test equipment is designed to measure the time variations, spectra, and anisotropy of the radiation fluxes in a broad energy band. The data are used to establish a correlation between the characteristics of the fluxes and the phenomena on the sun, in the interplanetary medium and in near-earth space. Author

N74-13154# Communications Research Centre, Ottawa (Ontario).
RADIO-FREQUENCY RADIOMETRY AS A REMOTE SENSING TECHNIQUE IN MARITIME RECONNAISSANCE AND MARINE SCIENCES IN A NORTHERN ENVIRONMENT
A. W. Adey and G. N. Reed Sep. 1973 22 p refs
(CRC-TN-660) Avail: NTIS HC $3.25

The application of the RF radiometry technique to the general maritime reconnaissance and marine sciences role in the Canadian North is discussed. Results of tests carried out with a helicopter-borne, multichannel, UHF radiometer in August 1972 in the Hudson Strait and Labrador Coast areas are included. Radiation data were obtained during flights over ships, ocean and fresh water, pack ice, icebergs, glaciers and land features. These initial results were encouraging in demonstrating the potential of the technique, not only in direct support of maritime operations through aiding in detection and identification of features of interest, but with possible application in areas such as hydrology and glaciology. Author

N74-13155# Research Inst. of National Defence, Stockholm (Sweden).
SCALE OF BLACKNESS FOR A LINE PRINTER FOR PICTURE GENERATION [SVAERTNINGSSKALA PA RADSKRIVARE FOER BILDGENERERING]
Jan-Olof Eklundh, Stig Grambo, and Torleiv Orhaug Mar. 1972 31 p refs In SWEDISH
(FOA-2-C-2531-E1) Avail: NTIS HC $3.75

The manufacture of a scale of blackness (grey levels) using a combination of a number of symbols on a line printer is reported. Calibration of a scale of blackness is also discussed. The results show that the reflection lies between 45 and 85%. Within this range of blackness there are about nine distinguishable levels of blackness obtained. Examples of pictures made by the line printer are included. Author

N74-13156# Research Inst. of National Defence, Stockholm (Sweden).
AN AIRBORNE HEAT CAMERA TEKLA 2 [FLYGVAERMEKAMERA TEKLA 2]
Gunnar Lundholm Nov. 1971 19 p In SWEDISH
(FOA-2-C-2497-E1) Avail: NTIS HC $3.00

An airborne heat camera called TEKLA II (thermal chart plotting apparatus) has been constructed. The new apparatus has been produced for the study of recordings of IR pictures on a multichannel data tape recorder and of a cooling engine with GeHg detector as well as for experiments with a fast rotating mirror of the same type as in TEKLA I. The report concludes with a description of the construction of the apparatus, its function and laboratory tests. Author

N74-13157# Research Inst. of National Defence, Stockholm (Sweden).
FLEXIBLE SUSPENSION GYRO [OM FJAEDERKARDANGYRON]
Peter Wolff Oct. 1971 56 p refs In SWEDISH
(FOA-2-C-2491-E4) Avail: NTIS HC $5.00

The functioning of the flexible suspension gyro is described. This is a new type of double axis gyro, its construction differs very much from conventional gyros, e.g. the gyro rotor is isolated from both container and driving motor, by a flexible suspension system. A theoretical model of the gyro shows that with a certain interpretation of input magnitudes, it can be described as a conventional two axis gyro. Practical tests demonstrated that the gyroflex function was wholly in accordance with the theoretical model and that its performance met announced specifications. Author

N74-13158# Research Inst. of National Defence, Stockholm (Sweden).
RECORDING THE PENETRATION OF A PROJECTILE INTO ALUMINIUM BY FLASH X-RAYS [ROENTGENBLIXTREGISTRERING AV PROJEKTILERS INTRAENGNING I ALUMINUM]
Uno Ek, Ake Persson, Ulf Rilbe, and Ake Stoegren Oct. 1971 43 p refs In SWEDISH
(FOA-2-C-2511-D4) Avail: NTIS HC $4.25

The paths of projectiles penetrating aluminium were reconstructed A rigid projectile (hard metal core) and a very deformed projectile (cylinder of soft steel) were observed. Synchronization

of the X-ray flash with the course of events was achieved by an electrical pulse marker on the surface and variable time delays. The displacement/time relationship for the two courses of events was determined with relative accuracy, the speed of the events with tolerable accuracy and retardation only was uncertain. It has been revealed that the deceleration power on the rigid projectile has a tendency to a reduction with increased speed in the range 0-800 m/s, and that the main features of the deceleration action of the deforming projectile agree with the simple RSV model. Author

N74-13159# Research Inst. of National Defence, Stockholm (Sweden).

PHOTOGRAPHIC SPECTROPHOTOMETRY AND COLLECTION OF DATA FROM A DISCHARGE OF OIL ON WATER [FOTOGRAFISK SPEKTROFOTOMETRI OCH DATAINSAMLING OM OLJEUTSLAEPP PA VATTEN]

Anders Boberg Dec. 1971 46 p refs In SWEDISH
(ROA-2-C-2508-E1) Avail: NTIS HC $4.50

The spectral reflections of oil and water are studied by means of photographic spectrophotometry and conclusions are presented about the possibilities of the photographic collection of data from oil streaks on water, together with practical points of view on how to carry it out. Photographic spectrophometry implies multispectral photography of the object and a calibrated grey scale from which the objects spectral reflection is obtained by comparison with the grey scale, via the blackening density curve. Reflected light from the water consists of surface reflection and backward diffusion from the water volume. The experiments show that the former is the highest in UV, whilst the latter has a peak in green. Oil has a very low reflection. The possibilities of separating oil from water photographically are good within the green part of the spectrum. Different types of fuel oil can hardly be inter-distinguished at all and as regards layer thickness, only the molecular layers which result in interference can be distinguished from other thicknesses. Author

N74-13160# Research Inst. of National Defence, Stockholm (Sweden).

COAXIAL MICROCALORIMETER: DESIGN AND FINAL TESTS [KOAXIELL MIKROKALORIMETER SLUTRAPPORT: KONSTRUKTION OCH PROVNING]

Ralf Bostroem Oct. 1971 41 p refs In SWEDISH; ENGLISH summary
(FOA-3-A-3749-E1/E2) Avail: NTIS HC $4.25

A coaxial microcalorimeter has been designed which will be used as a reference standard in measurements of microwave power at frequencies up to 8.5 GHz and a power level of 2 to 500 milliwatts. The calorimeter is of the twin-load type with special coaxial input lines, giving a stable temperature background. The comparison of microwave and dc power is made with dc resistance and voltage standards. The sensitivity of the calorimeter is of the order of 70 microvolts per milliwatt. This has been achieved by using a multijunction thermopile of 400 junctions in series. Author

N74-13161# Research Inst. of National Defence, Stockholm (Sweden).

ABSTRACTS FROM A STUDY VISIT TO SWITZERLAND [SAMMANFATTNING AV STUDIERESA TILL SCHWEIZ]

Torleiv Orhaug Mar. 1972 13 p In SWEDISH; partly in ENGLISH
(FOA-2-C-2530-M7) Avail: NTIS HC $3.00

Impressions from a visit to Switzerland are reported. The visit comprised attendance at the group meeting within the (International Geophysical Union) for the preparation of a report on remote sensing, and also a visit to the University in Bern for studying observations made in microwave radiometry. Author

N74-13162# Research Inst. of National Defence, Stockholm (Sweden).

A SIMPLE INTERFEROMETER AND SOME APPLICATIONS [ENKEL INTERFEROMETER MED NAGRA TILLAEMPNINGAR]

Ove Steinvall and Sture Hagmark Nov. 1971 22 p refs In SWEDISH
(FOA-2-C-2500-E1) Avail: NTIS HC $3.25

A very simple interferometer has been constructed. Its one element is a double layer mirror. The advantage of this interferometer is a minimum need for adjustment and stability. The interferometer is primarily intended for the study of small, geometrically limited phenomenon. A succession of simple demonstration experiments have been made. Author

N74-13163# Research Inst. of National Defence, Stockholm (Sweden).

EQUIPMENT FOR RECORDING TIME INTERVALS [UTRUSTNING FOER REGISTRERING AV TIDINTERVALL]

Nils-Erik Vall and Oerjan Carlsson Feb. 1972 94 p In SWEDISH
(FOA-3-C-3695-E2) Avail: NTIS HC $6;75

A time intervalometer is reported that is especially constructed for recording outage in fading channels. The equipment containing two measuring channels intended to be connected to their own punched tapes, is suitable for recording time intervals in the range from microseconds to 1000 seconds. Each measuring channel is provided with a recorder whose storage capacity is so dimensioned that a random series of measurements with an average value of up to 80% of the punched tape rate of reading back can be recorded with a negligible number of rejected measurements. Author

N74-13164# Research Inst. of National Defence, Stockholm (Sweden).

RADIOMETRY [RADIOMETRI]

A. G. Nikolaev and S. V. Pertsov Nov. 1971 133 p refs Transl. into ENGLISH of the Russian book In SWEDISH
(FOA-3-C-3681-E1) Avail: NTIS HC $8.75

Fundamental concepts of one of the recent branches of electronics, namely radiometry, are presented. Special interest is given to the military use of radiometry. A shortened explanation of the physical basis of radiometry and the principles of construction of radiometers for different purposes are provided. Also presented are the typical objective characteristics and simple approximate methods for tactical technological applications of radiometry. The book uses material from unclassified home and foreign sources. Author

N74-13165*# California Univ., Livermore. Lawrence Livermore Lab.

LLL ELECTRON AND PROTON SPECTROMETER ON NASA'S ORBITING GEOPHYSICAL OBSERVATORY 5 Final Report for experiment 6

H. I. West, Jr., R. M. Buck, and J. R. Walton 29 May 1973 66 p refs
(NASA Order S-70014-G; Contract W-7405-eng-48)
(NASA-CR-136218; UCRL-51385) Avail: NTIS HC $5.50 CSCL 14B

The LLL energetic electron and proton spectrometer on NASA's Orbiting Geophysical Observatory 5 (OGO-5) operated successfully from launch - March 4, 1968 - until retirement in August 1971. Data recovery during this time was about 95% of the orbit except for the last few months. The electron spectrometer used a magnetic field for electron momentum selection which served also as an electron broom for a proton range - energy telescope. The energy range was approximately 60 to 2950 keV for electrons (seven channels) and 0.10 to approximately 94 MeV for protons (seven channels). The experiment was scanned relative to the stabilized OGO-5 for obtaining directional information. Excellent data were taken throughout the magnetosphere and in the interplanetary region. Studies were carried out in the areas of equatorial pitch-angle distributions, substorm dynamics and field topology, particle spectra (time history), particle spatial distributions, and solar particle events. Author

N74-13166# Scientific Research Inst. of Electro-Physical Apparatus, Leningrad (USSR).

ONE POSSIBILITY OF MULTIFRAME HOLOGRAPHING OF MICROSECOND PROCESSES WITH SYNCHRONIZATION BY SIGNALS FROM INVESTIGATED PROCESSES

A. G. Smirnov, V. G. Smirnov, and D. I. Staselko 1972 9 p refs In RUSSIAN; ENGLISH summary
(NP-19826) Avail: AEC Depository Library HC $3.00

A holographic device for multiframe holographing of microsecond processes in a thermonuclear plasma is described. The spatial-temporal separation of coherent light beams necessary

for the registration of individual-frames holograms are made by separation of the active laser element by a screen having holes and a traveling-wave slit formed in an acoustic-optical shutter.
Author (NSA)

N74-13167# California Univ., Berkeley. Lawrence Berkeley Lab.
SOME CURRENT AND FUTURE TRENDS OF HIGH VOLTAGE TRANSMISSION ELECTRON MICROSCOPY
G. Thomas Mar. 1973 6 p refs Presented at the EMSA Meeting, New Orleans, 14-17 Aug. 1973
(Contract W-7405-eng-48)
(LBL-1802; Conf-730816-1) Avail: NTIS HC $3.00

It is shown that 1 MeV is an upper limit for most applications in materials science. Factors limiting electron microscopy of organic materials are discussed; 3 MeV may result in some improvement. Images are given for defects in Si. Antiphase domain boundary observations in lunar anorthite are reported; comparison with calculations show that the vectors are of type 1/2(110) for b domains and 1/2(111) for c domains. NSA

N74-13168# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
GRAVIMETRIC INVESTIGATIONS CARRIED OUT AT THE INSTITUTE OF CELESTIAL AND PHYSICAL GEODESY OF THE TECHNICAL UNIVERSITY, MUNICH, AND AT THE INSTITUTE OF CELESTIAL AND SATELLITE GEODESY OF THE TECHNICAL UNIVERSITY, DARMSTADT, 1968-1970 [GRAVIMETRISCHE UNTERSUCHUNGEN AM INSTITUT FUER ASTRONOMISCHE UND PHYSIKALISCHE GEODAESIE DER TU MUENCHEN UND AM LEHRSTUHL FUER ASTRONOMISCHE GEODAESIE UND SATELLITENGEODAESIE DER TH DARMSTADT 1968-70]
Erwin Groten Bayerische Acad. der Wiss. 1973 40 p refs In GERMAN; ENGLISH summary
(Ser-B-201) Avail: NTIS HC $4.00

The instrument constants of the LaCoste and Romberg gravimeter no. G-195 were established, including accuracy for field measurements and for tidal registrations. Possible variations of gravity readings with changes in temperature, air pressure, vibrations, and calibration function were investigated. The validity of the Munich measurements was tested by additional measurements at Darmstadt. ESRO

N74-13169# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
A TROCHOIDAL FILTER MASS SPECTROMETER FOR SOLAR WIND COMPOSITION MEASUREMENT [STUDIO DI UNO SPETTROMETRO DI MASSA A FILTRO TROCOIDALE PER MISURE DI COMPOSIZIONE DEL VENTO SOLARE]
Marco DAngelantonio May 1972 78 p refs In ITALIAN
(LPS-72-10) Avail: NTIS HC $6.00

The choice of a crossed field trochoidal filter is discussed by comparing the quardrupole spectrometer performances to the proposed one. A review of energy analyzing or non energy analyzing spectrometers is presented together with various types of mass spectrometers for interplanetary space measurements. The conditions for oblate or prolate trochoids are detailed, and reasons for the choice of oblate trochoids are given. The resolving power, magnetic induction, electric field strength, and angular acceptance are calculated together with the mass-velocity ranges of interest in the plasma analysis. Technical aspects such as physical dimensions instrument shape, electrodes, and magnet are discussed. A simulation on Univac 1108 computer was performed, and the results are discussed together with those of a visual simulation on a HP 2116 B computer. The influence of field inhomogeneities on particle trajectories is detailed. ESRO

N74-13170# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo studio del Plasma nello Spazio.
ASTIGMATISM OF A CONCAVE GRATING SPECTROSCOPE [STUDIO DELL'ASTIGMATISMO DI UNO SPETTROSCOPIO A RETICOLO CONCAVO]
Lucio Rossi Nov. 1972 35 p refs In ITALIAN
(LPS-72-26) Avail: NTIS HC $3.75

The OSO J concave grating spectrometer astigmatism effects are presented. The principal equation for the concave grating in reflection mode is detailed, and the image height discussed in the NAMIOKA formalism. In the same formalism, the image curvature due to astigmatism is discussed in the cases of punctual and extended source. Numerical results are given for incident angles of zero and 11.5 degrees. The 11.5 degree of incidence embodiment is shown to be preferable. ESRO

N74-13171# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
STUDY AND OPTIMIZATION OF AN INDUCTION MAGNETOMETER [PROGETTO E OTTIMIZZAZIONE DI UN MAGNETOMETRO AD INDUZIONE]
P. Cerulli-Irelli Jan. 1971 44 p refs In ITALIAN
(LPS-71-2) Avail: NTIS HC $4.25

Characteristic parameters of a search coil for spaceborne magnetometer are presented along with the optimization methods used to obtain the parameters. The sensitivity, effective magnetic permeability, and sensitivity frequency dependence are discussed. Signal to noise ratio, sensor, and amplifier noise are detailed. The maximum acceptable value for the S/N ratio was evaluated and choice of the diameter of the coil wire justified. The parameter optimization was performed with the use of an error function minimization procedure. ESRO

N74-13172# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
HEIGHT AZIMUTH MOVEMENT STUDY FOR TELESCOPE GUIDANCE [STUDIO DEL MOVIMENTO ALTAZIMUTALE PER L'INSEGUIMENTO DI UN TELESCOPIO]
Lucio Rossi Jan. 1973 46 p refs In ITALIAN
(LPS-73-3) Avail: NTIS HC $4.50

The altitude-azimuth coordinate compensating tracking for an IR telescope is presented. Various coordinate transformations are detailed with regard to absolute equatorial coordinate transformation to local equatorial and then to local horizontal coordinates. The star tracking problem is discussed and the time interval between telescope pointing change is evaluated. The telescope will be located in the Swiss Alps and will employ automatic guidance devices. For the corresponding site latitude the time between corrections, in order that the star remains within the diffraction circle of one arc second is five seconds in azimuth and 10 seconds in altitude. In the case where the altitude velocity and the azimuth velocity are taken equal to the earth angular velocity, the correction time interval on the telescope position is reduced to about 0.1 to 0.01 second. ESRO

N74-13173# Royal Aircraft Establishment, Farnborough (England).
PARTICLE SIZE MEASUREMENT BY IN-LINE HOLOGRAPHY
T. W. Chubb and J. B. Abbiss Mar. 1973 51 p refs
(RAE-TR-72229; BR34763) Avail: NTIS HC $4.75

Particle sizing by means of holography is discussed, providing a method of reproducing images of small particles. The size and position of particles may be determined by this method, and by extension to double exposure techniques, the velocity may also be found. In-line Fraunhofer systems are shown to be especially suitable for particle diameters in the 5 to 500 micron range, provided the maximum recording distance (particle to hologram) does not exceed limits. Author (ESRO)

N74-13174# Bendix Research Labs., Southfield, Mich.
THE MECHANISM OF EXOELECTRON EMISSION FROM SOLID SURFACES Final Report
P. Braunlich Sep. 1973 109 p refs
(Contract F44620-72-C-0064; AF Proj. 9761)
(AD-767612; BRL-6775; AFOSR-73-1673TR) Avail: NTIS CSCL 14/2

The results of a 15-month study of the mechanisms responsible for exoelectron emission are described in the final report. Included are: (1) a literature review, (2) descriptions of exoelectron imaging techniques, an ultrahigh vacuum system for exoelectron studies, and a retarding potential analyzer for energy distribution measurement of exoelectron emission, (3) a

discussion of a new exoelectron phenomenom in pyroelectric materials, (4) outline of work planned for the future, and (5) publications. Author (GRA)

N74-13175# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
OPTICALLY INDUCED DIFFRACTION GRATINGS IN LIQUID AND SOLIDS
David R. Dean Aug. 1973 164 p refs
(Contract N00014-68-A-0141-0002)
(AD-767076; TR-73-02) Avail: NTIS CSCL 14/2

The report describes the measurement of physical constants of a medium by an all optical technique. From the temporal behavior of the light diffracted by transient, optically induced gratings, the velocity of sound and thermal diffusivity of several materials have been determined and semiconductors carrier lifetimes have been determined. The method can be extended to the measurement of acoustic attenuation. Bulk properties of small samples can be measured without surface effects by inducing small optical perturbations in the refractive index delta n/n approximately equal 10 to the minus 5th power. Author (GRA)

N74-13176# Army Electronics Command, Fort Monmouth, N.J.
DESIGN CONCEPT OF A FORWARD AREA RAWINSONDE SET (FARS)
Raymond L. Robbiani Oct. 1973 19 p refs
(DA Proj. 1T0-62111-A-126)
(AD-767527; ECOM-5512) Avail: NTIS CSCL 04/1

The design concept of a Forward Area Rawinsonde Set (FARS) is described. This equipment will provide atmospheric soundings to an altitude of 12 km and to a ground range of at least 50 km. The set uses a unique tracking system which is the key to the large reduction in size and weight as compared to the Rawinsonde Set AN/GMD-1. The FARS will provide tracking accuracies at least as good as that of the Rawinsonde Set AN/GMD-1. The weight of the fully automated ground data receiving and sonde tracking system, excluding the power source, flight equipment and flight support items, will be approximately 100 pounds and 4 cubic feet in size.
Author (GRA)

N74-13075 Joint Publications Research Service, Arlington, Va.
NEW GEOPHYSICAL EQUIPMENT
V. M. Chashnik *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 1-18 Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 3-18 (For availability see N74-13074 04-13)

N74-13077 Joint Publications Research Service, Arlington, Va.
TEMPERATURE COMPENSATION OF QUARTZ GRAVIMETERS
A. P. Buketov *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 25-29 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 51, 1973 p 27-31 (For availability see N74-13074 04-13)

N74-13079 Joint Publications Research Service, Arlington, Va.
A TRANSISTORIZED SEISMIC SIGNAL AMPLIFIER
Sun Shun-I *In its* Geophys. Equipment (JPRS-60574) 19 Nov. 1973 p 34-38 refs Transl. into ENGLISH from Geofiz. App. (USSR), no. 516 1973 p 70-73 (For availability see N74-13074 04-13)

N74-13676 National Research Council of Canada, Ottawa (Ontario). Instruments Lab.
A WAVE BUOY ACCELEROMETER UNIT
E. H. Bowler *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Sep. 1973 p 33-53 refs (For availability see N74-13673 04-34)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-13177* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MOLDING PROCESS FOR IMIDAZOPYRROLONE POLYMERS Patent
Charles L. Johnson, inventor (to NASA) Issued 13 Nov. 1973 2 p Filed 29 Oct. 1971 Supersedes N72-22505 (10 - 13, p p 1576)
(NASA-Case-LAR-10547-1; US-Patent-3,772,418; US-Patent-Appl-SN-193980; US-Patent-Class-264-294) Avail: US Patent Office CSCL 13H

A process is described for producing shaped articles of imidazopyrrolone polymers comprising molding imidazopyrrolone polymer molding power under pressure and at a temperature greater than 475 C. Moderate pressures may be employed. Preferably, prior to molding, a preform is prepared by isostatic compression. The preform may be molded at a relatively low initial pressure and temperature; as the temperature is increased to a value greater than 475 C., the pressure is also increased.
Official Gazette of the U.S. Patent Office

N74-13178* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LYOPHILIZED SPORE DISPENSER Patent
Artie D. Jessup, inventor (to NASA) Issued 4 Dec. 1973 4 p Filed 13 Oct. 1971 Supersedes N72-21477 (10 - 12, p p 1617)
(NASA-Case-LAR-10544-1; US-Patent-3,776,432; US-Patent-Appl-SN-188928; US-Patent-Class-222-193) Avail: US Patent Office CSCL 13I

A lyophilized spore dispenser is provided which produces a finely divided, monoparticulate cloud of bacterial spores. The spores are contained within a tightly sealed chamber, and a turbulator orifice connected to an air supply source provides a jet of air which stirs up the spores and causes the spores to be suspended in eddy currents within the chamber. This air jet also produces a positive pressure within the chamber which forces the spores out of an injection orifice.
Official Gazette of the U.S. Patent Office

N74-13179* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF FORMING ARTICLES OF MANUFACTURE FROM SUPERALLOY POWDERS Patent
John C. Freche, William J. Waters, and Richard L. Ashbrook, inventors (to NASA) Issued 27 Nov. 1973 3 p Filed 10 Mar. 1972 Supersedes N72-21485 (10 - 12, p 1618) Continuation-in-part of US Patent Appl. SN-29917 filed 20 Apr. 1970
(NASA-Case-LEW-10805-2; US-Patent-3,775,101; US-Patent-Appl-SN-233743; US-Patent-Class-75-213; US-Patent-Class-29-182; US-Patent-Class-29-420.5; US-Patent-Class-75-200; US-Patent-Class-75-214; US-Patent-Class-75-226; US-Patent-Appl-SN-29917) Avail: US Patent Office CSCL 13H

A highly alloyed superalloy material is obtained using prealloyed powders. The material is easily shaped at high temperatures when it becomes superplastic because of its particular microstructure.
Official Gazette of the U. S. Patent Office

N74-13180 British Library Lending Div., Boston Spa (England).
TEST RESULTS OF HOT MACHINING AND PLASMA METAL REMOVAL
G. Spur and R. Clausen 3 Sep. 1973 12 p refs Transl. into ENGLISH of Tech. Univ., Inst. for Machine Tools, Berlin, report (BLL-RR-Trans-7567-(8660.5)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Hot machining of a high temperature seal permits a marked reduction in the cutting force and the cutting power with increasing

work piece temperature. Cylindrical and helical surfaces were made in the same material (without a cutting tool) using an arc plasma burner by metal removal. The volume removed per unit time was greater in this case than the corresponding volume machined away during turning. Author

N74-13181 British Library Lending Div., Boston Spa (England).
CALCULATION OF THE FORCES ON THE CONTACT SURFACE IN THE TREATMENT OF METALS BY PRESSURE
V. N. Bogdanov and N. G. Bekin [1973] 10 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 53-54 In ENGLISH and RUSSIAN
(BLL-M-21711-(5828.4F)) Avail: British Library Lending Div. Boston Spa, Engl.: 1 BLL photocopy coupon

The rolling and upsetting of metals is discussed. The law of variation of the ratio of tangential forces is found by the probability method. By using this law, a method is developed for determining the normal and tangential forces. An example of the calculation is included. Author

N74-13182 British Library Lending Div., Boston Spa (England).
THE DISCRETIZATION METHOD IN METAL PRESSURE WORKING PROBLEMS, REPORT 2
B. E. Khaikin, I. Ya. Tarnovskii, V. I. Odinokov, and V. G. Glazunov [1973] 13 p ref Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 73-77 In ENGLISH and RUSSIAN
(BLL-M-21713-(5828.4F); Rept-2) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The results of an investigation of the applicability and efficiency of the suggested discretization method are presented. The questions of the solution validity and convergence rate of this method are examined with respect to the problems involved in the upsetting of long strips between plane and rhombic dies. Two methods of solving the problem by the discretization method are dealt with, viz. by breaking the deformation zone into cells with given corrdinate elements (fixed grid), and into cells the corrdinate elements of which are taken as being not strictly given), and determining them along with the speed element values (flowing grid). Author

N74-13183 British Library Lending Div., Boston Spa (England).
DIFFERENTIAL MOIRE PICTURES USED FOR INVESTIGATING THE PRESSURE TREATMENT OF METALS
P. I. Polukhin, V. K. Vorontsov, G. V. Budnikov, A. B. Kudrin, and V. G. Gorokh [1973] 10 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 78-80 In ENGLISH and RUSSIAN
(BLL-M-21714-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The representation of different moire bands by an equation in parametric form is discussed. Pressure treatment processes for metals are investigated, and accurate values of lines for different values of the derivative components of displacements are obtained. The manner of distribution of displacements in the deformed region is also shown. Author

N74-13184 British Library Lending Div., Boston Spa (England).
A NEUTRAL ANGLE EQUATION ALLOWING FOR CONCRETE DEFORMED STATE SYSTEMS
M. N. Potoskuev [1973] 9 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 90-92 In ENGLISH and RUSSIAN
(BLL-M-21715-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Equations are deduced for calculating the neutral angle during rolling with allowance for the characteristic conditions of concrete deformed state systems. The general solution to the differential equation for the horizontal component of the slip path relative to the three-dimensional deformation system is developed. The solution allows for the spread and deformation inhomogeneity factors in the system. Mathematical approximations of the vertical and transverse plastic deformation components were used for the solution. Author

N74-13185 British Library Lending Div., Boston Spa (England).
ANALYTICAL CALCULATION OF THE AREA OF CONTACT BETWEEN THE METAL AND THE ROLL IN A FOUR ROLL ROUND-SQUARE SYSTEM
Yu. I. Kokovikhin and Yu. A. Nesmeev [1973] 11 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 93-96 In ENGLISH and RUSSIAN
(BLL-M-21716-(5828.4F)) Avail: British Library Lending Div. Boston Spa, Engl.: 1 BLL photocopy coupon

A numerical method is presented of calculating the contact surface area during deformation in a four-roll round-square system with the grooves filled to different extents with metal. The solutions obtained are compared with a solution obtained with an electronic computer and a solution obtained using approximate equations. The contact surface area, confined for instance, within a parabolic curve, differs by 15-17% from the true area. An example of determining the area of contact is given. Author

N74-13186 British Library Lending Div., Boston Spa (England).
RELATIONSHIP OF INTERNAL FLUCTUATIONS IN THICKNESS IN CLAD METAL TO THE DRAWING AND ANNEALING CONDITIONS
V. A. Masterov, I. A. Andryushchenko, I. K. Suvorov, Yu. A. Voropaev, E. A. Ivanon, and P. M. Efremova [1973] 11 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 102-105 In ENGLISH and RUSSIAN
(BLL-M-21717-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The effects of the total deformation between annealing operations, the annealing temperature, and the annealing time on the coefficient of variation in the thickness of a metal clad layer are analyzed mathematically. The purpose of the investigation is to reduce the fluctuations in the thickness of the clad layer around the transverse cross-sectional perimeter of silver and copper clad wire. The procedure followed in obtaining the desired reduction in fluctuations is described. It is stated that the process makes it possible to reduce the consumption of silver by 20 percent, with the same minimum clad metal layer thickness. Author

N74-13187 British Library Lending Div., Boston Spa (England).
TOOLS FOR COLD EXTRUSION: THE ARRANGEMENT OF TOOLS FOR THE PRODUCTION OF COLD-PRESSED COMPONENTS ON AUTOMATIC MULTI-STAGE PRESSES
G. Pferdhirt 10 Oct. 1973 6 p Transl. into ENGLISH from Ind.-Anz. (Essen), v. 95, no. 63, 1973 p 1472-1474 In ENGLISH and GERMAN
(BLL-NEL-TT-2512-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The design and fabrication of tools for producing various extruded components are presented. Figures of the tools are included. K.M.M.

N74-13188 British Library Lending Div., Boston Spa (England).
RESULTS FROM THE FURTHER DEVELOPMENT OF SOLID LUBRICANTS
K. Dunker 5 Jul. 1973 7 p Transl. into ENGLISH from Schmiertechnik (-Duesseldorf), v. 3, no. 7, 1972 p 206-209
(BLL-Risley-TR-2685-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The use of MOS2 in lubricants is discussed for oil suspensions, pastes, and light-colored lubricants. F.O.S.

N74-13189 British Library Lending Div., Boston Spa (England).
INDUSTRIAL USES OF BORON NITRIDE (BN)
S. Murasato Sep. 1973 17 p refs Transl into ENGLISH from Seramikkusu (Tokyo), v. 7, no. 4, 1972 p 35-40 (243-248)

(BLL-RTS-8097) Avail: British Library Lending Div., Boston Spa, Engl.: £ 1.60 or 5 BLL photocopy coupons

The characteristics of boron nitride and its application for industrial use are discussed. The process for synthesizing boron nitride is described. The crystal structure of boron nitrides and the effect on the physical properties of the material are analyzed. The properties of moldings made from boron nitrides are analyzed for lubrication, thermal expansion, electrical properties, corrosion resistance, and bending strength. Author

N74-13190 Arizona State Univ., Tempe.
THE NATURAL FREQUENCIES AND CRITICAL SPEEDS OF A ROTATING, FLEXIBLE SHAFT-DISK SYSTEM Ph.D. Thesis
Donald Ray Chivens 1973 172 p
Avail: Univ. Microfilms Order No. 73-21886

The geometric model consists of a flexible continuous shaft carrying a rigid core and flexible continuous plate. The shaft supports were chosen to allow no radial deflection while producing no moment restraint. For the linear, undamped system, the term natural frequency has the conventional meaning of those discrete frequencies at which the unforced system will undergo harmonic oscillations. The natural frequencies of shaft-disk system are functions of spin speed, whether or not disk flexibility is included. The term critical speed is defined as that angular speed at which the spin speed equals a shaft-disk system natural frequency. Dissert. Abstr.

N74-13191 Pennsylvania State Univ., University Park.
ANALYSIS OF THE MECHANISMS OF FAILURE RESULTING FROM STAINLESS STEEL CASTING Ph.D. Thesis
John Michael Samuels, Jr. 1972 346 p
Avail: Univ. Microfilms Order No. 73-20121

The mechanisms of die failure resulting from stainless steel casting were studied analytically and experimentally by: (1) evaluating the ability of a group to test materials to withstand direct contact with stainless steel, (2) simulating the temperature distributions in the solidifying casting using a heat transfer model, and (3) simulating the stress distributions in the die as a result of the thermal environment. All test results pertain to a gravity cast flat plate configuration. The experimental program consisted of collecting life test data up to 500 cycles for 22 die materials which included ceramic coated steels, refractory metals, and copper; refractory metals; and hard metals. The four criteria used to evaluate changes in die materials with successive casting cycles were: surface roughness, weight loss, surface characterization by electron and optical microscopy, and X-ray analysis of test button surfaces. Dissert. Abstr.

N74-13192 Missouri Univ., Columbia.
AN ANALYSIS OF THE PULSED ELECTROMAGNETIC DETECTION OF DEFECTS IN CYLINDERS Ph.D. Thesis
Mona Mohamed Mursi 1972 167 p
Avail: Univ. Microfilms Order No. 73-21468

The problem of eddy current detection of defects in infinitely long conducting solid cylinders, is analyzed. For an encircling coil driven by a current impulse, the eddy current density inside a cylinder was derived. The Hertz vector representing the fields of a dipole driven by a current impulse, and embedded in the conducting cylinder, was obtained. A small defect was assumed to exist inside the cylinder. That defect was replaced by a dipole driven by a current equal in magnitude and opposite in direction to the eddy current that would be at the position of the defect if the defect were absent. Using the previously obtained expressions for the eddy current inside the cylinder, and the Hertz vector of the fields of a dipole embedded in the cylinder, Fourier series analysis was used to obtain the defect-induced voltage in a differential pick-up coil system. Dissert. Abstr.

N74-13193*# TRW Systems Group, Redondo Beach, Calif.
STUDY OF ADVANCED TECHNIQUES FOR DETERMINING THE LONG TERM PERFORMANCE OF COMPONENTS Final Report, 14 Feb. 1972 - 14 Mar. 1973
Mar. 1973 219 p refs
(Contract NAS7-782)
(NASA-CR-136199; TRW-16568-6028-R0-00) Avail: NTIS HC $13.00 CSCL 14D

The application of existing and new technology to the problem of determining the long-term performance capability of liquid rocket propulsion feed systems is discussed. The long term performance of metal to metal valve seats in a liquid propellant fuel system is stressed. The approaches taken in conducting the analysis are: (1) advancing the technology of characterizing components through the development of new or more sensitive techniques and (2) improving the understanding of the physical of degradation. Author

N74-13194*# TRW Systems Group, Redondo Beach, Calif.
SPACE SHUTTLE SEAL MATERIAL AND DESIGN DEVELOPMENT FOR EARTH STORABLE PROPELLANT SYSTEMS Final Report
Oct. 1973 449 p refs
(Contract NAS9-12729)
(NASA-CR-134067; TRW-22539-6001-R0-00) Avail: NTIS HC $24.50 CSCL 11A

The results of a program to investigate and characterize seal materials suitable for space shuttle storable propellant systems are given. Two new elastomeric materials were indentified as being potentially superior to existing state-of-the art materials for specific sealing applications. These materials were AF-E-124D and AF-E-411. AF-E-124D is a cured perfluorinated polymer suitable for use with dinitrogen tetroxide oxidizer, and hydrazine base fuels. AF-E-411 is an ethylene propylene terpolymer material for hydrazine base fuel service. Data are presented relative to low and high temperature characteristics as well as propellant exposure effects. Types of data included are: mechanical properties, stress strain curves, friction and wear characteristics, compression set and permeability. Sealing tests with a flat poppet-seal valve were conducted for verification of sealing capability. A bibliography includes over 200 references relating to seal design or materials and presents a concise tabulation of the more useful seal design data sources. Author

N74-13195*# Douglas Aircraft Co., Inc., Long Beach, Calif.
ADHESIVE-BONDED DOUBLE-LAP JOINTS
L. J. Hart-Smith Jan. 1973 114 p refs
(Contract NAS1-11234)
(NASA-CR-112235) Avail: NTIS HC $7.75 CSCL 13D

Explicit analytical solutions are derived for the static load carrying capacity of double-lap adhesive-bonded joints. The analyses extend the elastic solution Volkersen and cover adhesive plasticity, adherend stiffness imbalance and thermal mismatch between the adherends. Both elastic-plastic and bi-elastic adhesive representations lead to the explicit result that the influence of the adhesive on the maximum potential bond strength is defined uniquely by the strain energy in shear per unit area of bond. Failures induced by peel stresses at the ends of the joint are examined. This failure mode is particularly important for composite adherends. The explicit solutions are sufficiently simple to be used for design purposes Author

N74-13196*# Douglas Aircraft Co., Inc., Long Beach, Calif.
ADHESIVE-BONDED SINGLE-LAP JOINTS
L. J. Hart-Smith Jan. 1973 123 p refs
(Contract NAS1-11234)
(NASA-CR-112236) Avail: NTIS HC $8.25 CSCL 13D
For abstract, see N74-13195

N74-13197*# McDonnell-Douglas Corp., Long Beach, Calif.
ADHESIVE-BONDED SCARF AND STEPPED-LAP JOINTS
L. J. Hart-Smith Jan. 1973 123 p refs
(Contract NAS1-11234)
(NASA-CR-112237) Avail: NTIS HC $8.25 CSCL 13H

Continuum mechanics solutions are derived for the static load-carrying capacity of scarf and stepped-lap adhesive-bonded joints. The analyses account for adhesive plasticity and adherend stiffness imbalance and thermal mismatch. The scarf joint solutions include a simple algebraic formula which serves as a close lower bound, within a small fraction of a per cent of the true answer for most practical geometries and materials. Digital computer programs were developed and, for the stepped-lap joints, the critical adherend and adhesive stresses are computed for each step. The scarf joint solutions exhibit grossly different behavior from that for double-lap joints for long overlaps inasmuch as that the potential bond shear strength continues to increase with indefinitely long overlaps on the scarf joints. The stepped-lap

joint solutions exhibit some characteristics of both the scarf and double-lap joints. The stepped-lap computer program handles arbitrary (different) step lengths and thickness and the solutions obtained have clarified potentially weak design details and the remedies. The program has been used effectively to optimize the joint proportions. Author

N74-13198# North American Systems Corp., Londonderry, N.H.
INFRARED INSPECTION OF ELECTRICAL EQUIPMENT Final Report, Phase 2, Nov. 1972 - Jul. 1973
George S. Ginsburg and Roger L. Hall Washington FAA Jul. 1973 170 p refs
(Contract DOT-FA72WA-2908)
(C-208-2; FAA-RD-73-164) Avail: NTIS

Infrared temperature measurements of electrical equipment at the New York Air Route Traffic Control Center were made. These data were analyzed statistically and conclusions were drawn regarding the normal operating temperature range for these equipments. Temperatures were calculated which indicate the highest normal operating temperature and the temperature at which corrective action should be initiated. Laboratory tests were performed on various equipments which were operated above the normal temperature range to confirm predictions. A survey of infrared instruments is also included, and a handbook on the use of infrared technique for preventative maintenance of electrical equipment is provided. Author

N74-13199*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FINE PARTICULATE CAPTURE DEVICE Patent Application
Victor S. Peterson and Robert D. Siewert, inventors (to NASA) Filed 8 Nov. 1973 8 p
(NASA-Case-LEW-11583-1; US-Patent-Appl-SN-414042) Avail: NTIS HC $3.00 CSCL 13B

To capture fine particulate matter in a gas such as air, a dielectric fluid is directed to the center of whichever face of a rotating disc is exposed to the air flow. The disc is comprised of two or more segments which bear opposite electrostatic potentials. As the dielectric fluid is centrifuged towards the periphery of the rotating disc, the fluid becomes charged to the same potential as the segment over which it is passing. Particulate matter is attracted to the charged segment and is captured by the fluid. The fluid then carries the captured particulate matter to a collection device such as a toroidal container disposed around the periphery of the disc. A grounded electrically-conductive ring may be disposed at the outer periphery of the disc to neutralize the captured particles and the fluid before they enter the container. NASA

N74-13200*# Pyronetics, Inc., Santa Fe Springs, Calif.
DESIGN AND DEVELOPMENT OF SPACE STORABLE, EXPLOSIVELY ACTUATED VALVE Final Report, Jun. 1970 - Dec. 1971
Gerhard P. F. Meyer Dec. 1973 182 p refs
(Contract NAS3-14340)
(NASA-CR-134491) Avail: NTIS HC $11.25 CSCL 13I

An experimental program was conducted to design, fabricate, and test a flightweight, explosively actuated valve, specifically for use with cryogenic fuels and fluorinated oxidizers. Flow tests were made on a normally open valve, 2-1/2 inch (6.35 cm) line size, in H2O, LH2, LF2 and CCL4 to evaluate flow characteristics, leakage rates, material compatibility, primer and main charge burn rates, and system dynamics,. The program resulted in demonstrating valve compatibility with LF2 and sealing ability in H2O and LH2. The valve failed to close securely with fluids whose density was similar to LF2 regardless of the valve temperature. Concurrently, an analytical model describing the valve actuation and the associated energy dissipation was developed. This model indicated that the valve design will be capable of functioning in high density fluids by increasing the input actuation energy. Proposed modifications to the existing valve were noted and a subsequent valve design was made. Author

N74-13201*# United Aircraft Corp., East Hartford, Conn. Research Labs.
DEVELOPMENT OF A PROCESS FOR PRODUCING RIBBON SHAPED BORON FILAMENTS
Malcolm Basche and Bernarr Jacob [1973] 37 p
(Contract NAS1-12125)
(NASA-CR-132356) Avail: NTIS HC $4.00 CSCL 13H

A ribbon-shaped boron filament with a tensile strength of 138 KN/sq cm (200 ksi) was investigated. The investigation was carried out using both carbon and tungsten as substrate materials. No satisfactory results were obtained utilizing uncoated, copper-plated or silicon carbide coated tungsten ribbon substrates. Carbon ribbon substrates were prepared by pyrolysis of stretched polyimide tape. A severe deposition gradient occurred in all dc reactor experiments due to convective cooling at the edge of the substrate that resulted in a weak, nonuniform filament. RF heating, however, completely eliminated this gradient problem and a 90 cm (35.5 in.) long boron ribbon was produced at .85 cm/sec (100 ft/hr) using a frequency of 40.68 megahertz. This boron ribbon, however, exhibited a light-bulb effect during deposition to 59 KN/sq cm (85.7 ksi) were obtained from this ribbon. Several silicon carbide ribbon shaped filaments were also produced during this investigation by decomposition of CH3SiHCl2 onto carbon substrates. Contrary to the boron work, silicon carbide ribbon was readily prepared in dc static reactors. A very uniform and smooth deposition was obtained with strengths up to 71.1 KN/sq cm (103.5 ksi). Author

N74-13202# Forsvarets Teletekniska Lab., Stockholm (Sweden).
A COMPUTERIZED SYSTEM FOR RELIABILITY PREDICTIONS: RPP-1. PART 1: INTRODUCTION
H. Broberg, I. Hansson, L. Joensson, and I. Persson Aug. 1972 38 p refs
(FTL-A-A16:23-Pt-1) Avail: NTIS HC $4.00

The RPP-1 (Reliability Prediction Program -1) is described, which is for turning reliability prediction into a readily available tool for designers, systems engineers, and maintenance technicians. The system structure was made flexible through the use of interchangeable component models. Reliability related research findings are quickly made available simply by exchanging component models. The models used so far only cover electronic and electromechanical components. The practical applications of the program therefore are limited to electronic equipment. The program's greatest asset is its capacity for picking out relevant reliability information for each individual component in its actual functional location. Hence the program is also suitable for use as a library routine on the component level. The program is a system comprising a great number of subprograms in FORTRAN for IBM 360/75. Author

N74-13203# Research Inst. of National Defence, Sundbyberg (Sweden).
TRIBOCHEMISTRY [TRIBOKEMI]
Per Atterby and Goeran Aqvist Dec. 1971 34 p refs In SWEDISH
(FOA-1-A-1542-F8/D2/F1) Avail: NTIS HC $3.75

The conception of tribochemistry has in practice come to be concerned only with the sort of chemical phenomena that occur in lubrication, such as happen at high temperature or high loading and with thin films, i.e. boundary layer lubrication. Different forms of wear are dealt with and some test equipments are described. The amount of oxygen and moisture in the atmosphere influences lubrication. Adsorption of certain compounds such as esters, alcohols, carbon dioxide acids and amines also influences lubrication and reduces friction between steel surfaces. With metahydrodynamic and non-hydrodynamic greases, the grease must contain tribochemically active ingredients. In the metahydrodynamic range, fosphor and phosphor/sulfur compounds have been shown to be suitable additives. Certain sulfur containing compounds are active as extreme pressure additives. Different materials containing chlorine have been used for a long time as additives for extremes of pressure. The mechanisms of different effective ingredients are considered. Author

N74-13204# Stanford Univ., Calif. Dept. of Statistics.
MAINTENANCE MODELS FOR STOCHASTICALLY FAILING EQUIPMENT
John V. Wagner, Jr. 14 May 1973 130 p refs
(Contract N00014-67-A-0112-0052; NR Proj. 042-002)

(AD-766805; TR-153) Avail: NTIS CSCL 14/4

Two maintenance models are developed for machines subject to two distinct modes of failure. In the single machine model, the equipment is inspected at discrete time intervals and classified according to its deterioration, positive states representing deterioration towards one mode of failure and negative states towards the other. Transition among states of deterioration is governed by a Markov chain. At each inspection there is the option of replacing the machine at a cost dependent upon the state of the equipment. If no replacement is made, an operating cost, also state dependent, is charged. Sufficient conditions on the Markov chain and the replacement and operating costs are developed which guarantee that the optimal maintenance policy minimizing total discounted and long run average costs is a control limit replacement rule: replace the machine if and only if its state is higher than a designated positive state or lower than a designated negative state. Characterization of the optimal policy allows for efficient computation through linear programming. A parametric linear programming analysis indicates how the policy varies with different costs. (Modified author abstract) GRA

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-13205* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

THERMOMAGNETIC RECORDING AND MAGNETO-OPTIC PLAYBACK SYSTEM HAVING CONSTANT INTENSITY LASER BEAM CONTROL Patent

George W. Lewicki and John E. Guisinger, inventors (to NASA) Issued 11 Dec. 1973 9 p Filed 6 Oct. 1971 Supersedes N73-31468 (11 - 22, p 2680) Continuation-in-part of US Patent Appl. SN-034989, filed 6 May 1970 Sponsored by NASA (NASA-Case-NPO-11317-2; US-Patent-3,778,791; US-Patent-Appl-SN-187143; US-Patent-Class-340-174.1M; US-Patent-Class-179-100.2CH; US-Patent-Class-250-205; US-Patent-Class-250-217; US-Patent-Class-340-174YC; US-Patent-Class-350-151; US-Patent-Appl-SN-34989) Avail: US Patent Office CSCL 20E

A system is developed for maintaining the intensity of a laser beam at a constant level in a thermomagnetic recording and magneto-optic playback system in which an isotropic film is heated along a continuous path by the laser beam for recording. As each successive area of the path is heated locally to the vicinity of its Curie point in the presence of a controlled magnetic field, a magneto-optic density is produced proportional to the amplitude of the controlled magnetic field. To play back the recorded signal, the intensity of the laser beam is reduced and a Faraday or Kerr effect analyzer is used, with a photodetector, as a transducer for producing an output signal.

Official Gazette of the U.S. Patent Office

N74-13206 British Library Lending Div., Boston Spa (England).

THE USE OF A GAS LASER FOR THE MEASUREMENT OF CURRENTS OF HIGH INTENSITY BY MEANS OF THE FARADAY EFFECT

V. Andresciani and R. DeLeo 3 Sep. 1973 14 p refs Transl. into ENGLISH from Elettrotechnica (Italy), v. 58, no. 11, Nov. 1971 p 607-612

(BLL-CE-Trans-6017-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

After a brief description of the Faraday effect in transparent electric media, experimental results are reported concerning the measurement of the Verdet constant of heavy glasses and optical fibers by means of an He-Ne laser beam. In particular, with regard to optical fibers, the effect of depolarisation due to the propagation of the coherent radiation through the fibers was measured experimentally, and the advantages of these fibers for the measurement of current and the protection of lines at the highest voltages are pointed out. A heavy flint glass and a bundle of optical fibers are then used for the measurement of large currents over a wide range of values between 0.5 and 7 kA.

Author

N74-13207# Technisch Physisch Dienst TNO-TH, Delft (Netherlands).

HOLOGRAPHIC DETERMINATION OF THE CIRCULAR SPECTRUM IN A CAVITATION TUNNEL [HOLOGRAFISCHE BEPALING VAN HET BELLENSPECTRUM IN EEN CAVITATIE-TUNNEL]

N. B. Oosterveld and R. L. VanRenesse 3 Sep. 1973 21 p refs In DUTCH

(TPD-1973-0-1; Rept-305-107) Avail: NTIS HC $3.25

The cavitation spectrum in a ultrahigh velocity water flow tunnel is determined by argon and pulsed ruby laser holography. High resolution photography shows the release of bubbles greater than 10 micrometer diameter in the upward section of the tunnel.

Transl. by G.G.

N74-13208# Defence Research Establishment Valcartier (Quebec).

VARIABLE ATTENUATOR FOR TEA CO2 LASERS

R. W. MacPherson Nov. 1973 13 p refs

(DREV Proj. 97-01-38)

(DREV-R-701/73) Avail: NTIS HC $3.00

A system for controlling the intensity of TEA carbon dioxide lasers is described. The system consists of a gas cell containing a suitable absorbing gas such as propylene or propane to attenuate the laser output. Attenuation of megawatt pulses may be obtained free of temporal or spatial distortions and independent of the polarization of the laser beam.

Author

N74-13209# Research Inst. of National Defence, Stockholm (Sweden).

PATTERNED LIGHT, A SIMPLE PRODUCTION METHOD AND SOME APPLICATIONS [RANDIGT LJUS, EN ENREL FRAMSTAELLNINGSMETOD SAMT NAGRA TILLAEMPNINGAR]

Sture Hogmark and Robert Nilsson Nov. 1971 32 p refs In SWEDISH

(FOA-2-C-2502-E1) Avail: NTIS HC $3.75

Increased information can be contained in a two dimensional photograph if the photograph is taken by a special laser beam in the form of close lying parallel even beams. This light results from interference after reflexion in a mirror. An object illuminated by such light becomes patterned. A photograph of the illuminated object can be used to calculate its size and form provided the experimental geometry is known (comparison with holpgraphic interferometry and strain optics). The patterned light has also been used for the measurement of small angular displacements where a resolution of 2 + 0.0001 degrees can be obtained.

Author

N74-13210# Research Inst. of National Defence, Stockholm (Sweden).

PULSE CIRCUIT FOR N2 LASERS [PULSKRETS FOR N2-LASER]

Ove Steinvall, Anders Widen, Abbas Anvari, and Robert Nilsson Nov. 1971 32 p refs In SWEDISH

(FOA-2-C-2503-E1) Avail: NTIS HC $3.75

A very simple pulsed gas laser has been constructed for generating short laser pulses with high power, high repetition frequency and good stability. The system has been tested for nitrogen at 3371 A. The following data have been obtained: Pulse length 5 ns, output power 500 kW, and repetition frequency 100 pps. The cavity can be used for laser wave lengths with less reinforcement. Some of the physical parameters have also been examined, such as coherency characteristics of amplifiers and beam divergence, etc. The electrical circuit used was built on the well known Marx generator principle and can also be used as a pulses are required, for example, for producing short X-ray flashes. A disadvantage of the circuit is that it has rather many spark gaps which produce certain problems concerning flash overs.

Author

N74-13211# Commissariat a l'Energie Atomique, Limeil-Brevannes (France). Centre d'Etudes.

EXPERIMENTAL STUDY OF RAYLEIGH SCATTERING WITH A RUBY LASER BEAM: RELATIVE VARIATION OF SCATTERED LIGHT WITH THE NUMBER OF SCATTERING CENTERS AND NATURE OF THE GASES Ph.D. Thesis - Paris Univ.

C. Bayer Jun. 1973 67 p refs In FRENCH
(CEA-R-4429) Avail: AEC Depository Libraries HC $5.50

The experimental variation of the scattered light with the number of scattering centers and with the refractive index of gases is in agreement with thetheoretical Rayleigh scattering. A direct calibration system gives the absolute value of the Rayleigh ratio. The experimental value appears to be half of the theoretical one. Author (NSA)

N74-13212# Los Alamos Scientific Lab., N.Mex.
US AEC LASER-FUSION PROGRAM
K. Boyer 1972 14 p Presented at the European Laser-Fusion Conf., Marly le Roi, France, 9-13 Oct. 1972 Sponsored by AEC
(LA-DC-72-1113; Conf-721099-2) Avail: NTIS HC $3.00

The AEC laser-fusion program is conducted primarily at the Los Alamos Scientific Laboratory of the University of California and the Lawrence Livermore Laboratory. The program consists of work in four major areas: pellet design and burn calculations and experiments, laser-matter interactions theory and experiments, laser development, and application studies. The basic technique considered here is to use the laser energy to compress and heat the pellet in a symmetrical fashion to achieve burning conditions. Such calculations indicate the ratio of thermonuclear energy to laser energy might be 70 to one for a fairly optimum case assuming that compressions of several thousand-fold might be achieved. These calculations predict a coupling efficiency of laser energy to the fuel proper of 10%. A review of the program is presented. Author (NSA)

N74-13213# Institut Franco-Allemand de Recherches, St. Louis (France).
FLOW VIBRATIONAL ENERGY DIAGNOSTICS [LE DIAGNOSTIC DE L'ENERGIE VIBRATIONNELLE DANS UN ECOULEMENT]
S. Bihl and R. Joeckle 9 Feb. 1973 28 p refs In FRENCH
(Contract DRME-72/545)
(ISL-NB-3/73) Avail: NTIS HC $3.50

The vibrational energy created by an electric discharge in a supersonic carbon dioxide flow was investigated in order to increase the output power of CO2 lasers. Two complementary techniques are proposed to achieve these diagnostics gain measurement, which produces the difference of the upper and lower level population of the laser; and emission absorption in infrared, which produces the temperature of a vibration mode of CO2. These diagnostics should be completed by measuring or estimating the thermodynamic temperature of the discharge. ESRO.

N74-13214# Calspan Corp., Buffalo, N.Y.
TWO-DIMENSIONAL EFFECTS IN LASER-SOLID SIMULATION STUDIES Final Studies, 1 Jun. 1971 - 31 Jul. 1973
J. W. Daiber, H. M. Thompson, and R. G. Rehm Aug. 1973 36 p refs
(Contract F44620-71-C-0102; AF Proj. 9751)
(AD-767599; CALSPAN-WG-5003-A-2; AFOSR-73-1700TR) Avail: NTIS CSCL 20/9

The objective of this program is to study the two-dimensional wave motions induced in a target by high-power laser radiation. For these studies the target is an axisymmetric, supersonic free-jet of hydrogen gas which is laser irradiated on axis. The transparency of the target permits luminosity and schlieren streak photography of the forward-facing waves that propagate into the high-pressure plenum. Measurements of the axial and lateral luminous plasma growth during the laser pulse and of the axial shock wave growth after the pulse have been obtained for hydrogen gas targets over a range of plenum pressures and laser powers. It has been found that the axial luminous-front growth can be predicted by a deflagration model; in this model the velocity scales with the parameter absorbed power divided by gas reservoir pressure to the one-third power. The shock-wave velocity along the axis of symmetry also appears to scale with this parameter. An explanation for this latter result has been proposed. Author (GRA)

N74-13215# Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
DEVELOPMENTS IN HIGH POWER LASER RESEARCH Final Report
A. Hertzberg Jun. 1973 134 p refs
(Grant AF-AFOSR-1926-70; AF Proj. 9783)
(AD-767611; AFOSR-73-1690TR) Avail: NTIS CSCL 20/5

The effects of high-power laser technology programs on basic research activities in this country and abroad are described and analyzed. The particularly multidisciplinary nature of laser research which has had a special impact on physicists, fluid dynamicists and researchers in other branches of engineering science is highlighted. Also included to indicate the universal interest in the problem areas is the program of the Esfahan Symposium on Fundamental Laser Physics, held in Tehran, Iran late in August 1971 at which Russia, Poland, Austria, Italy, Israel, Japan, Canada as well as the U.S. presented papers. Future directions for research are described and inhibiting factors on achieving the desired plateau of knowledge from which developments should proceed are outlined. Author (GRA)

N74-13216# Owens-Illinois, Inc., Toledo, Ohio. Corporate Technology Div.
DAMAGE THRESHOLD STUDIES OF GLASS LASER MATERIALS Semiannual Technical Report, 1 Jan. - 30 Jun. 1973
N. L. Boling and George Dube 30 Jun. 1973 66 p refs
(Contract DAHC15-72-C-0170)
(AD-767049) Avail: NTIS CSCL 20/5

Results of studies of Q-switched laser damage to transparent uncoated dielectric surfaces are presented. Some findings are also applicable to damage of optical coatings. Studies of damage morphology and threshold for several different glasses show that a bright plasma does not invariably accompany surface damage. Consequently, studies of surface damage that are based on the appearance of a visible plasma may lead to incorrect inferences regarding thresholds and mechanisms. The morphology of aplasmic damage, along with other evidence, strongly suggests that this damage is caused by absorption by submicron inclusion near the surface, and not electron avalanche. Polishing compound and process can be major factors determining damage threshold. Elimination of scratches from the surface is not a sufficient condition for raising the threshold. Construction of a high energy density laser operating at 30 ns is also described. Author (GRA)

N74-13217# Army Electronics Command, Fort Monmouth, N.J.
Nd:YAG 1.06 MICRON LASER COMMUNICATION SYSTEM
Martin I. Wolfe Sep. 1973 32 p refs
(DA Proj. 1S6-62701-A-448)
(AD-767224; ECOM-4148) Avail: NTIS CSCL 17/2

A pulse gated binary modulation communication system is analyzed. A detailed analysis of the detection statistics culminating in the calculation of the probability of error for various meteorological conditions and transmission ranges is provided. The analysis is based upon a system designed to transmit 200 megabits of information over a 5 kilometer range in severe haze with the realization of a 10 to the minus 6th power bit error rate. Author (GRA)

N74-13218# Aerospace Corp., El Segundo, Calif.
PERFORMANCE OF TRIPLE SLIT NOZZLE FOR CHEMICAL LASER APPLICATIONS Technical Report, Sep. 1971 - Mar. 1972
Donald A. Durran and Robert L. Varwig 28 Sep. 1973 40 p refs
(Contract F04701-73-C-0074)
(AD-767190; TR-0074(4240-10)-2; SAMSO-TR-72-296) Avail: NTIS CSCL 20/5

A triple slit nozzle was constructed for use on a continuous, diffusion-type, HF chemical laser. In this nozzle, a primary supersonic stream of He, F, and F2 is separated from the H2 stream by a buffer stream of He. When the primary stream contains large amounts of F2, either because the dissociation level is down or because there is less diluent, the buffer stream serves to reduce the severity of the reaction between F2 and H2 near the nozzle exit plane. The results of measurements of the flow properties of the triple slit nozzle and its use in an SF6 laser are discussed in this report. Author (GRA)

N74-13219# Aerospace Corp., El Segundo, Calif.
A SIMPLE MODEL OF A LINE SELECTED, LONG CHAIN, PULSED DF-CO2 CHEMICAL TRANSFER LASER Technical Report, 1 Apr. - 30 Jun. 1972
Ronald L. Kerber 25 Jul. 1973 43 p refs
(Contract F04701-73-C-0074)
(AD-767194; TR-0074(4640)-3; SAMSO-TR-73-298) Avail: NTIS CSCL 20/5

A rate equation model of a pulsed DF-CO2 chemical transfer laser is simplified by investigating the relationship of kinetic mechanisms. The model reduces to one equation which when solved permits calculation of all pulse characteristics as a function of time. At low levels of initiation, predictions of this laser simulation model are in excellent agreement with those of a more comprehensive model presented in an earlier paper. Model predictions are also found to be consistent with experiment. The simplicity of the present model lends itself to easy physical interpretation and permits efficient and accurate prediction of transfer laser performance characteristics in regimes of practical interest. Author (GRA)

N74-13220# Aerospace Corp., El Segundo, Calif.
EXPERIMENTAL CW CHEMICAL LASER STUDIES Technical Report, Jul. 1970 - Jun. 1971
Donald J. Spencer and Robert L. Varwig 15 Sep. 1973 48 p refs
(Contract F04701-73-C-0074)
(AD-767192; TR-0074(4240-10)-3; SAMSO-TR-73-295) Avail: NTIS CSCL 20/5

Experimental studies of The Aerospace Corporation's continuously operating diffusion-type HF chemical lasers are presented. Nonuniform flow profiles at the laser nozzle exit are deducted by the use of pitot and total-temperature probes. The presence of shock waves and the measured flow profiles were of particular interest in the explanation of laser performance under varied flow conditions. Low-diluent-ratio flows resulted in a deterioration of laser performance partly because of thermal blockage effects. Alternate nozzles were plugged in order to provide lateral jet expansion relief, which resulted in improved laser performance. Pressure scaling was investigated up to approximately 5 atm plenum pressure and 16-torr cavity pressure. For fixed plenum conditions, an increase in cavity pressure resulted in a decrease in laser power and axial lasing length (due to oblique shocks and nozzle separation). For fixed cavity pressure, an increase in plenum pressure resulted in an increase in power and axial lasing length (due to a reduced boundary layer). The cavity pressure for peak power corresponded quite closely to the cavity pressure predicted for matched nozzle flow. Author (GRA)

N74-13221# Aerospace Corp., El Segundo, Calif. Lab. Operations.
LASING FROM THE UPPER VIBRATIONAL LEVELS OF A FLASH-INITIATED H2-F2 LASER Technical Report, May - Jul. 1972
Steven N. Suchard 15 Sep. 1973 20 p refs
(Contract F04701-73-C-0074)
(SAMSO-TR-73-286; AD-767191; TR-0074(4531)-1) Avail: NTIS CSCL 07/4

Lasing on the v equals 6 to 5 and 5 to 4 vibration rotation bands has been observed on the time resolved spectral output of a helium diluted H2-F2 chain reaction chemical laser. The HF lasing molecules were produced by the reaction of a 50 torr mixture of mole ratio H2/F2/He - 0.5/1/40 initiated by flash photolysis of the F2. Strong lasing was found from all P-branch vibrational-rotation bands from v equals 6 to 5 and 1 to 0. Within some bands, the time sequence of transitions suggests non-Boltzmann distributions on the rational states. Author

N74-13222# Aerospace Corp., El Segundo, Calif.
MEASUREMENT AND ANALYSIS OF THE HF RADIATION FROM A REACTING SUPERSONIC JET Technical Report, Jan. 1971 - Jan. 1972
Munson A. Kwok 15 Sep. 1973 66 p refs

free jet of a continuous HF chemical laser with a slit nozzle bank has been measured at a number of downstream positions. Three cases are reported: high-power flow (1) that includes O2, (2) without O2, and (3) with reduced SF6. Spatially averaged number densities of the HF vibrational levels (v = 1, 2, 3, 4) have been determined for the zero-power case. Vibrational nonequilibrium is evident. Observed rotational temperatures range from 560 down to 400 K. Gain coefficients are deduced. Data have been fitted to both a one-dimensional, constant-pressure streamtube jet model and a two-dimensional model; the best fit occurs with the latter. Deactivation plays an important role in determining the average gain. The principal deactivator of HF(v) is H. Other important deactivation mechanisms are vibration-vibration transfers with HF or H2. (Modified author abstract) GRA

N74-13223# United Aircraft Corp., East Hartford, Conn.
ULTRA-WIDEBAND THIN FILM MODULATORS FOR CO2 LASERS Semiannual Technical Report, 25 Mar. - 25 Sep. 1973
P. K. Cheo, M. Gilden, J. F. Black, and J. L. Swindal 30 Sep. 1973 60 p refs
(Contract N00014-73-C-0087; ARPA Order-1860)
(AD-767415; UARL-M921513-4) Avail: NTIS CSCL 20/5

The long range objective of this program is to develop an efficient and practical ultra-wideband thin film modulator for CO2 lasers useful for optical image radars and high-data-rate optical communication systems. During the present contracting period (25 May 1973 to 25 December 1973), the goal of this program is aimed at the demonstration of efficient sideband generation of a 10.6 micrometer CO2 laser carrier at microwave frequencies (X-band) in a nonlinear GaAs thin film optical modulator element which is interfaced with a microwave ridge guide structure. Electrooptic interaction in a GaAs thin film between an optical guided-wave and either a traveling or a synchronous standing microwave signal can produce a sideband at the sum and difference frequencies. By using a frequency modulated microwave field, a chirped optical signal in the sideband is generated. This signal can be separated from others by a proper optical filtering technique such as a diffraction grating or a narrow bandpass interferometer. GRA

N74-13224# United Aircraft Corp., East Hartford, Conn.
PICOSECOND LASER PULSES Semiannual Technical Report, 1 Mar. - 31 Aug. 1973
William H. Glenn 30 Sep. 1973 45 p refs
(Contract N00014-66-C-0344; ARPA Order 1806)
(AD-767427; UARL-M920479-42) Avail: NTIS CSCL 20/5

The report reviews briefly the application of ultrashort pulses to imaging radars, and shows the need for an alternate signal processing scheme. A mathematical description and physical interpretation of frequency domain sampling is presented and its application to time scaling and matched filtering is discussed. An experiment to demonstrate the technique is outlined and will be carried out during the next reporting period. GRA

N74-13225# Massachusetts Inst. of Tech., Cambridge.
BEHAVIOR OF ORGANIC DYE SOLUTION LASERS Final Report, 1 Nov. 1969 - 31 May 1973
Jeffrey I. Steinfeld 31 Aug. 1973 45 p refs
(Contract DAHC04-70-C-0015)
(AD-767285; AROD-8658-4-P) Avail: NTIS CSCL 07/3

The report summarizes research in which the authors have examined the time development of the various frequencies in a grating-tuned, flash-pumped dye solution laser and interpreted these in terms of a four-state kinetic model that they have previously used with success for a description of molecular gas lasers. One of the significant parameters in the description of this model is the extent and nature of the homogeneous broadening in the dye molecule, and they have investigated this aspect by studying the temperature and solvent state dependence of dye absorption and emission spectra. Radiative lifetimes and self-quenching cross sections have been determined for glyoxyl and iodine monochloride using tuned laster pulses. Another

N74-13226# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
PERFORMANCE EVALUATION AND REACTION KINETICS OF A PULSED HF LASER Technical Report, 29 Oct. 1971 - 28 Oct. 1972
J. D. McClure, D. B. Nichols, and K. H. Wrolstad Aug. 1973 119 p refs
(Contract F29601-72-C-0008; ARPA Order 1256)
(AD-767230; AFWL-TR-73-7) Avail: NTIS CSCL 07/5

Variation of performance of a laser-initiated HF laser with variation in reagent concentrations, reagent-diluent concentration ratio, and initial dissociation level is described. The HF laser intensity transients exhibit characteristic temporal structure representative of free-running chain reactions and collisional transfer processes in reacting H2 - F2 mixtures. Explicit exposure of underlying mechanisms is achieved by fast dissociation of F2 via second harmonic radiation derived from a Q-switched ruby laser pulse, and by simultaneous time-resolved spectral measurements of laser emission on a number of vibration-rotation transitions. Continued laser emission over many chain-reaction steps, even for relatively low dissociation levels, supports the position that pulsed chemical lasers are attractive candidates for high power applications. (Modified author abstract) GRA

N74-13082 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF DISTORTION OF A LASER LIGHT PULSE DURING PROPAGATION IN THE SEA
I. I. Kalinin, V. N. Pelevin, A. L. Skrelin, and D. M. Sherbaf *In its* Optics of the Ocean and the Atmosphere (JPRS-60572) 19 Nov. 1973 p 11-17 refs Transl. into ENGLISH from Opt. Okeana i Atm. (USSR), 1972 p 168-174 (For availability see N74-13080 04-13)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-13227 Rice Univ., Houston, Tex.
PROBLEMS IN THE DEFORMATION OF METALS. 1: VACANCY FORMATION FREE ENERGY. 2: DISLOCATION ATTACK FREQUENCY. 3: MICROSTRAIN IN STAGE 1 EASY GLIDE REGION Ph.D. Thesis
William Joseph Arnoult, III 1973 226 p
Avail: Univ. Microfilms Order No. 73-21531

Specific problems assoiated with establishing an understanding of the defect structure and mechanical behavior of metals were treated. A new insight was given to the isotropic elastic continuum approach for the energy of vacancy formation. The misfitting sphere model of Friedel was employed under the assumption that the vacancy core is not a void region but contains a Fermi gas. A complete nonquantum mechanical study of the stress dependence of dislocation attack frequency was made by considering all the physical parameters of a wide variety of dislocation-obstacle configurations. The macroscopic work hardening theories were extended to the microstrain region after easy glide prestrain according to the assumptions of Salama and Roberts in this region. Dissert. Abstr.

N74-13228 California Univ., Los Angeles.
STRENGTHENING OF BETA TITANIUM ALLOYS Ph.D. Thesis
Louis Angelo Rosales 1973 207 p
Avail: Univ. Microfilms Order No. 73-16699

The beta yields alpha (bcc-hcp) transformation was studied in detail for two beta-isomorphous titanium alloys, Beta-III (Ti-11.5Mo-6Zr-4.5Sn) and Ti-18Mo. Transmission electron microscopy, X-ray diffraction experiments, tensile testing and hardness testing were employed to establish the transformation kinetics and the microstructure as a function of thermomechanical history. Thermomechanical treatments were designed which maximized tensile properties through a refinement of the microstructure. It was found that for single aging, the reaction beta yields alpha + beta occurs for higher aging temperatures (above 800 F in Beta-III) and that the reaction beta yields omega sub T + beta yields omega sub T + alpha + beta yields alpha + beta occurs for lower aging temperature. The transition phase, omega sub T, has a hexagonal structure. If the aging temperature is low enough (below 700 F in Beta-III) no alpha phase forms even after long aging times. Dissert. Abstr.

N74-13229 British Library Lending Div., Boston Spa (England).
REFRACTORY METALS AND ALLOYS
Erich Gebhardt, Eckehart Fromm, and Friedrich Benesovsky 5 Jul. 1973 20 p Transl. into ENGLISH from Z. Werkstofftech. (Weinheim), v. 3, no. 4, 1972 p 198-203 In ENGLISH and GERMAN
(BLL-LTI-746-1438-(9022.401)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

A review of refractory metallic materials with emphasis on niobium, tantalum, molybdenum, and tungsten and their alloys is presented. The subjects discussed are: (1) fields of application of refractory metals and alloys, (2) properties of refractory metals, (3) production and fabrication, and (4) research and development trends. Author

N74-13230 British Library Lending Div., Boston Spa (England).
EFFECT OF HEAT TREATMENT ON THE SPECIFIC BREAKING ENERGY OF CrMoV STEELS
I. Artinger 5 Jul. 1973 15 p refs Transl. into ENGLISH from Banyaszat Kohaszat (Hungary), v. 1, no. 4, 1968 p 120-124
(BLL-CE-Trans-6153-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The effects of heat treatment on the creep and tensile properties, at room temperature and 530-580 C, of CrMoV steels were determined. It was impossible to determine the optimum conditions of heat treatment according to the amount of alloying elements dispersed in the carbide phase; it is suggested, that the value of specific breaking energy, determined from the results of tensile tests, gave a graphic representation from the CrMoV steels after various heat treatments. The greater the specific breaking energy, with suitably high limit of proportionality, the greater was the creep strength. Author

N74-13231 British Library Lending Div., Boston Spa (England).
INVESTIGATION OF IRRADIATION INDUCED CREEP OF A 15Cr15NiTiB STEEL
Kd. Closs 5 Jul. 1973 5 p refs Transl. into Atomwirtschaft (Duesseldorf), Apr. 1973 p 173-174
(BLL-Dounreay-Tran-638(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Tests were conducted to determine the effects of irradiation on the creep properties of metals used for fast reactor fuel element holders. It is stated that in-pile creep tests on AISI 304 and 316 type steels at irradiation temperatures of 525 C and 840 C showed no effect of neutron radiation on the creep rate. In this temperature range, the concentration of thermal vacancies is appreciably higher than that of irradiation-induced vacancies. No effect on the creep behavior results as long as no irradiation induced precipitations occur. Author

N74-13232 British Library Lending Div., Boston Spa (England).
DISPERSE ORDER
Hans Warlimont and Hans P. Aubauer [1973] 32 p refs Transl. into ENGLISH from Z. fuer Metallkunde (West Ger.), v. 64, no. 7, 1973 p 484-491 In ENGLISH and GERMAN
(BLL-M-23201-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 4 BLL photocopy coupons

Experimental and theoretical investigations are presented which suggest the characterization of the disperse order in alloys, as a special state of equilibrium. Various short range models are presented. Experimental indicators of the occurrence of the disperse order are discussed along with comparisons of the disperse order and short range models. A theoretical treatment is included of the stability of short range order states. Author

N74-13233 British Library Lending Div., Boston Spa (England).

MECHANICAL PROPERTIES OF LOW-ALLOY STEELS IMPROVED BY NORMALIZING AND QUENCHING

M. I. Rusetskaya, V. F. Pyankova, E. K. Babenko, M. V. Zhelanova, and E. S. Prikhodko 1973 3 p Transl. into ENGLISH from Stal (Moscow), v. 3, 1973 p 271

(BLL-M-21731-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Improvements in the mechanical properties of low alloy steels by normalizing and quenching are discussed. The heat treatment procedure is described. Impact tests were conducted following heat treatment and it was found that the specimens met the desired specifications. It is stated that quenching and tempering entirely eliminates rejection of metal products. Author

N74-13234 British Library Lending Div., Boston Spa (England).

THE COALESCENCE OF FACETED CRYSTALS

A. A. Baranov and O. N. Grishina [1973] 11 p refs Transl. into ENGLISH from Izv. Vyysh. Ucheb. Zaved., Chern. Met. (Moscow), no. 4, 1973 p 136-138 In ENGLISH and RUSSIAN

(BLL-M-21736-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The coalescence of faceted carbide crystals in two alloys of iron containing 15.2% W and 1.78% C and 21.2% W and 1.57% C, during annealing at 1150 C for 100h, was studied. It was proved that, during coalescence, the phase composition and form of the carbide crystals do not alter. The results of the research were analyzed in connection with the generalization of the Thomson-Freundlich equation obtained in the work. Author

N74-13235 British Library Lending Div., Boston Spa (England).

EFFECTS OF NITROGEN ON SUSCEPTIBILITY TO THE SPLITTING OF DISLOCATIONS IN NIOBIUM

M. N. Ageev, A. N. Ivanov, and L. I. Savina [1973] 13 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 4, 1973 p 132-135 In ENGLISH and RUSSIAN

(BLL-M-21737-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The true dimensions of the regions of coherent dissipation in the 100 and 110 directions have been determined, by analyzing the shape of X-ray diffraction lines, for niobium with different oxygen and nitrogen contents. The outlines of the (110)-(220) and (200)-(400) lines were recorded by a DRON-1 apparatus with automatic recording. The speed of movement by the counter was 1/8 deg/min. To reduce vertical divergence a Soller slit was used. The concentration of deformation and twinning packing defects and the dislocation density were determined at room temperature. As the concentration of nitrogen in solid solution increased, the susceptibility of Nb to the formation of packing defects increased, while O has practically no effect. During ageing at 200 C following the deformation, the nature of the alteration was the same for all specimens. At first there is an abrupt reduction, then an increase, up to values higher than in the initial deformed state. The theory is expressed that this form of relationship is due to the simultaneous formation of segregates of impurity atoms at dislocations of the Cottrell and Suzuki type. Author

N74-13236 British Library Lending Div., Boston Spa (England).

THERMODYNAMIC STABILITY OF SURFACE LAYERS IN THE WETTING OF SOLID BODIES BY METAL MELTS

Yu. A. Minaev [1973] 22 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 19-22 In ENGLISH and RUSSIAN

(BLL-M-21709-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The thermodynamic stability of surface layers in the wetting of solid bodies by metal melts was investigated. The process was conducted under conditions which exclude reaction. The wetting of solid bodies having less surface tension values than metals is possible with positive disjoining pressure. The wetting process occurs by way of a mechanism of the formation of films of a finite thickness by means of polymolecular surface diffusion. Data are presented on the wetting of nickel nitrides by cobalt alloys. Author

N74-13237 British Library Lending Div., Boston Spa (England).

THE CONTINUOUS ALLOYING METHOD FOR INVESTIGATING THE STRUCTURAL TRANSITIONS IN MOLTEN ALLOYS

E. S. Filippov [1973] 18 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met.(USSR), v. 3, 1973 p 114-120 In ENGLISH and RUSSIAN

(BLL-M-21719-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The construction of property composition isotherms from the addition of molten droplets of alloying elements to the developing alloys is reported. Observed reordering processes in Fe-Ni alloys show that a sharp change in property occurs during a change in the number of impurity atoms equal to the number of nearest neighboring solvent atoms in the structural components of the solid phase. A mutual reaction sphere model is formulated for predicting property changes in metallic solutions in correlation with the concentrated and saturated state. G.G.

N74-13238 British Library Lending Div., Boston Spa (England).

THE SOLIDIFICATION STRUCTURE AND MECHANICAL PROPERTIES OF UNIDIRECTIONALLY SOLIDIFIED Al-Si ALLOYS

R. Ozaki, K. Kobayashi, and K. Mori Sep. 1973 23 p refs Transl. into ENGLISH from Nippon Kinzoku Gakkaishi (Sendai City), v. 34, no. 4, 1970 p 433-441

(BLL-RTS-7688) Avail: British Library Lending Div., Boston Spa, Engl.: £ 2.20 or 7 BLL photocopy coupons

The physical properties of solid solution alloys of aluminum and silicon were examined. Four kinds of specimens were examined to determine the effects of silicon content on the structural changes in proeutectic aluminum dendrites and eutectic silicon. The effects of change of microporosity on yield strength, tensile strength, and elongation were analyzed. The configurations of the specimens and the procedures for conducting the tests are described. Author

N74-13239 British Library Lending Div., Boston Spa (England).

AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF INDUCTION HARDENING ON FATIGUE STRENGTH. 10: BEHAVIOUR OF RESIDUAL STRESS DURING APPLICATION OF CYCLIC STRESS

Y. Udagawa Sep. 1973 27 p refs Transl. into ENGLISH from Nippon Kikai Gakkai Rombunshu (Japan), v. 35, 1969 p 693-700

(BLL-RTS-8315) Avail: British Library Lending Div., Boston Spa, Engl.: £ 2.60 or 9 BLL photocopy coupons

Experiments were conducted on low carbon steel and medium carbon steel using specimens which were hardened under three different sets of conditions to establish the correlation between quenched microstructure and the behavior of residual stress during application of cyclic stress. The measurements of the specimens used were identical with those of small test pieces used in conventional fatigue tests. The shape and dimensions of the test pieces used in the fatigue tests and for the measurement of residual stress, the chemical composition of the materials, and the hardening conditions are described. The data are presented for the following: (1) the effect of cyclic stress on residual stress, and (2) fatigue strength in relation to ease of decay of residual stress. Author

N74-13240 British Library Lending Div., Boston Spa (England).

PRECIPITATION PROCESSES IN Cu-Zr-Cr ALLOYS

H. Suzuki and M. Kanno Nov. 1973 17 p refs Transl. into ENGLISH from Nippon Kinzoku Gakkaishi (Sendai City), v. 36, no. 4, 1972 p 363-368

(BLL-RTS-8519) Avail: British Library Lending Div., Boston Spa, Engl.: £ 1.60 or 5 BLL photocopy coupons

An investigation of the precipitation processes for the two precipitate phases of copper-zirconium-chromium alloys was

conducted. The order of precipitation and the rates of precipitation were determined by electrical resistance and specific heat measurements. The change in resistance during the aging of the materials at 400 C and 450 C immediately after solution treatment and quenching was investigated. It was determined that precipitation processes in the ternary alloy cannot be isolated in isothermal aging, but can be isolated by temperature-rise aging. Author

N74-13241 British Library Lending Div., Boston Spa (England).
THE DENSITY OF THIN ALUMINUM AND TITANIUM FILMS
V. A. Dmitriev and Yu. P. Khodyrev Nov. 1973 6 p refs Transl. into ENGLISH from Mater. Nauch. Konf. Inst. Org. Fiz. Khim. Akad. Nauk. (SSSR), 1970 p 170-173
(BLL-RTS-8368) Avail: British Library Lending Div., Boston Spa, Engl.: £0.50; 2 BLL photocopy coupons

The relationship between the density of aluminum and titanium films, formed by thermal or cathodic sputtering, and the film thickness is considered. It is shown that with thermal sputtering the film density approximates to the density of the bulk material at a thickness of about 2200 A for both Ti and Al at in the range of 450 to 5000 A. In the range 300 to 2200 A, the change of density with thickness is approximately 2.5 times greater for Ti than for Al. With cathodic sputtering, a charpe increase in film density with thickness is observed. Electron photomicrographs showed that in the range of 900 to 1400 A an overgrowth of cross links between the separate crystals occurs, the process taking place uninterruptedly in thermal sputtering, but only spasmodically in cathodic sputtering. Author

N74-13242 Kentucky Univ., Lexington.
DEFORMATION KINETICS IN TITANIUM AND TITANIUM ALLOYS AT LOW TEMPERATURES Ph.D. Thesis
Bruno R. DeMeesterDeBetzenbroeck 1972 329 p
Avail: Univ. Microfilms Order No. 73-20583

The concept of thermally activated deformation of crystalline solid is reviewed. Special attention is directed towards defining the thermodynamic parameters from experimental measurements. Although the subject is treated from a general viewpoint, the special case of the overcoming of separate obstacles is studied more thoroughly. Appropriate expressions relevant of the short-range obstacle only excluding contributions of the long-range internal stress field or variation of the activation dislocation length prior to the activated event are developed and applied to the deformation dynamics of titanium. Dissert. Abstr.

N74-13243 Missouri Univ., Columbia.
AN EXPERIMENTAL INVESTIGATION OF BERYLLIUM PROPERTIES BY USE OF THE NEUTRON PULSE PROPAGATION METHOD Ph.D. Thesis
Robert Edmond Miles 1972 166 p
Avail: Univ. Microfilms Order No. 73-21798

The objectives of this study were twofold. The first objective was to determine experimentally the dispersion law of beryllium for comparison with existing theoretical models. Secondly, an effort was directed toward experimentally confirming the existence or nonexistence of the continuum contamination which has been predicted for small assemblies. The neutron pulse propagation technique was used to study beryllium. Four assemblies were studied ranging in size from 18 by 56 by 94 cm to 59 by 62 by 94 cm. Thermal-neutron pulses were generated by slowing down 14.7 MeV neutrons in a thermalizing tank. All assemblies studied had transverse bucklings, greater than the critical buckling, however, for the larger assemblies studied, good agreement with theory was obtained for frequencies less than 600 Hz. Continuum contamination was observed for all assemblies studied.
Dissert. Abstr.

N74-13244 Engineering Sciences Data Unit, London (England).
FATIGUE CRACK PROPAGATION IN THIN SHEET ALUMINUM ALLOY
Oct. 1973 15 p refs Supersedes Fat-A.06.04 Sponsored by Roy. Aeronaut. Soc.
(ESDU-73021; ESDU-Fat-A.06.04) Copyright. Avail: Issuing Activity

The rate of growth of cracks in thin aluminum alloy sheet subjected to a constant amplitude tensile fatigue loading was investigated. The data were derived from tests on a large number of specimens which contain a central crack in which plane stress conditions prevail at the crack tup. The tests were conducted in laboratory air, at room temperature, and the loading frequencies were in the range from 80 cycles per second to 0.5 cycles per second. The data relate to sheets with thicknesses between 1.0 millimeter and 4.1 millimeters. Author

N74-13245*# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
DEVELOPMENT OF DUCTILE HIGH-STRENGTH CHROMIUM ALLOYS, PHASE 2 Final Report
A. M. Filippi Sep. 1973 78 p refs
(Contract NAS3-15559)
(NASA-CR-134522; WANL-M-FR-73-005) Avail: NTIS HC $6.00 CSCL 11F

Strength and ductility were evaluated for chromium alloys dispersion hardened with the putative TaC, TaB, CbC, and CbB compounds. TaC and TaB proved to be the most potent strengtheners, but when combined, their effect far outweighed that produced individually. Tests at 1422 K (2100 F) on an alloy containing these two compounds at the combined level of 0.5 m/o revealed a 495 MN/sq m (70 ksi) tensile strength for wrought material, and a 100 hour rupture strength of 208 MN/sq m (30 ksi) when solution annealed and aged to maximize creep resistance. These levels of high temperature strength greatly exceed that reported for any other chromium-base alloy. The ductile-to-brittle transition temperature (DBTT) of the two phase strengthened alloy occurred at approximately 588 K (600 F) when heat treated to optimize creep strength and was not improved by fabrication to produce a wrought and recovered microstructure. The lowest DBTT measured on any of the alloys investigated was 422 K (300 F). Strengthening phases actually formed in Cr-Ta-B and Cr-Cb-B compositions are probable M2CrB2 (M=Ta or Cb) compounds of tetragonal crystal structure. The likely habit relationship between these compounds and chromium is postulated. Cube habit coherency was identified for TaC precipitation in chromium by electron microscopy. In another study, the maximum solubility of carbon in chromium was indicated to lie between 3/4 and 1 a/o and that of boron to be < 1/2 a/o. Author

N74-13246# Chalmers Univ. of Technology, Goteborg (Sweden). School of Electrical Engineering.
INVESTIGATIONS ON HEAT TREATED IRON AND CHROMIUM DOPED RUTILE AND APPLICATION TO A TRAVELING WAVE MASER Ph.D. Thesis
Per-Olaf Andersson 1972 62 p refs
(TR-23) Avail: NTIS HC $5.25

The temperature dependence of the spin-Hamiltonian parameters for substitutional Cr(3+)-ions in single crystal rutile (TiO2) has been studied. The measurements were performed at about 9.2 GHz and 35 GHz on a fine powder of single crystalline Cr-TiO2 for three temperatures, 95 K, 200 K, and 295 K. It was found that the spin-Hamiltonian parameter D diminishes with decreasing temperature in the temperature interval studied. The behaviour of g and E is more complex. A tentative extrapolation of the data towards 0 K has been made. Author

N74-13247# Aeronautical Research Labs., Melbourne (Australia).
THE INFLUENCE OF STRESS INTENSITY HISTORY ON FATIGUE-CRACK GROWTH
N. E. Ryan Jun. 1973 17 p refs
(ARL/Met-Rept-92) Avail: NTIS HC $3.00

A comparison between constant amplitude and variable amplitude fatigue-crack propagation in high strength D6ac steel shows that both acceleration and retardation of crack growth occurs. These changes in rate of crack growth, at the same stress intensity values, correspond directly with ascending and descending changes respectively, in load level. Such effects are explained in terms of a crack opening stress and its dependence upon previous load intensity. Author

N74-13248# Central Electricity Generating Board, London (England).
FRACTURE TOUGHNESS OF STEELS, 1964 - 1973

P. G. Williams Oct. 1973 17 p refs
(CE-Bib-237) Avail: NTIS HC $3.00

A bibliography of reports on the fracture toughness of steels is presented. Each report is identified by the title, corporate source, and author. A brief abstract accompanies each entry. A total of 64 reports are identified. P.N.F.

N74-13249# Research Inst. of National Defence, Stockholm (Sweden).

PROJECTILE PENETRATION: AN ORIENTATED METALLOGRAPHIC INVESTIGATION [PROJEKTILINTRAENGNING. EN ORIENTERANDE METALLOGRAFISK UNDERSOEKNING]

T. Hesslevik, Nils-Erik Karlesson, Ake Persson, and Ake Sjoegren Oct. 1971 49 p refs In SWEDISH
(FOA-2-C-2489-D4) Avail: NTIS HC $4.50

Different metallographic methods are outlined for studying the penetration of projectiles into hard material. Etching and heat treatment procedures were applied to sectioned and polished test pieces from penetration experiments. Both the target and projectile materials were made of steel. The deformation was explained qualitatively and to some extent quantitatively by means of microscope and micro hardness gauge. A good picture of the deformation was recreated and a surprisingly good agreement was obtained between results of different methods. Previously unknown patterns in the deformation picture were visualized. Author

N74-13250# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Labs.

ACCELERATED OXIDATION OF ZIRCALOY-2 IN SUPERCRITICAL STEAM

B. Cox Apr. 1973 32 p refs
(AECL-4448) Avail: AEC Depository Libraries HC $3.75; Atomic Energy of Can. Ltd., Chalk River: HC $1.00

Although a few earlier examples of excessive oxidation of Zircaloy-2 in high-temperature steam at high pressures have been reported, evidence suggested that at higher steam pressures the effects could be more serious. In this study it was found that the oxidation rate of Zircaloy-2 rises rapidly as the steam pressure increases into the supercritical region. The large pressure dependence of the oxidation rate is a function of heat treatment, which apparently displaces the oxidation rate versus pressure curve along the pressure axis. Thus, the previous instances of catastrophic oxidation of Zircaloy-2 at high temperatures represent the appearance of highly pressure-dependent oxidation following heat treatments, which shifts the curve into the range of normally employed test pressures. The onset of this phenomenon appears to be related to changes in the growth morphology of the oxide. Author (NSA)

N74-13251# Tennessee Univ., Knoxville. Dept. of Chemical and Metallurgical Engineering.

ASSESSMENT OF THE ACCURACY OF THE HIGH-TEMPERATURE HEAT CAPACITY OF SOLID METALS

C. R. Brooks and E. E. Stansbury 1973 10 p refs Presented at Symp. on Physico-Chem. Tech. at High Temp., Baden, Austria, 3 Sep. 1973
(Contract AT(40-1)-3291)
(Conf-730920-1) Avail: NTIS HC $3.00

Comparison of the values of the reported high-temperature heat capacity of solid metals frequently shows wide variance, usually increasing with increasing temperature. Unfortunately, measurements on specimens made from the same stock material frequently show deviations well outside the uncertainty claimed by the investigators. Typical data on aluminum oxide, Al Au, Fe, Pt, and Ta are presented to illustrate the significance of the problem. It is clear that the origin of most of the differences lies in unrecognized errors in the experimental techniques. Possible sources of errors and the practicality of establishing a metal as a heat capacity standard are discussed. Author (NSA)

N74-13252# Oak Ridge National Lab., Tenn.

TENSILE PROPERTIES OF FAST-REACTOR NEUTRON-IRRADIATED bcc METALS AND ALLOYS

F. W. Wiffen 1973 22 p refs Presented at the Conf. on Defects and Defect Clusters in bcc Metals and Their Alloys, Gaithersburg, Md., 14 Aug. 1973 Sponsored by AEC
(Conf-730813-4) Avail: NTIS HC $3.25

Rod tensile samples of Nb, Mo, Ta, one alloy based on each of these metals, and two V-base alloys were irradiated in EBR-II at temperatures between 390 and 1140 C to neutron fluences in the range 1.5 to 6.1 x 10 to the 22nd power neutrons/square centimeter. The effect of neutron irradiation at these fluences and temperatures on the strength and ductility properties was determined in tensile tests at temperatures between 20 and 800 C at strain rates of 0.02 per minute or slower. The effect of irradiation is most severe in Mo-base systems. Irradiation near 400 C renders Mo-50% Re brittle to at least 800 C. Similar irradiation of Mo and Mo-0.5% Ti produces a high concentration of small dislocation loops in the microstructure and raises the strain-rate-dependent tensile DBTT from below room temperature to the range 400 to 550 C. Brittle failures occur with a mixed cleavage and grain boundary spearation fracture mode. Author (NSA)

N74-13253# California Univ., Livermore. Lawrence Livermore Lab.

MODEL RELATING STRESS, STRAIN, STRAIN RATE, AND TEMPERATURE WITH AN EXPERIMENTAL DATA, FIT FOR HIGH-PURITY TANTALUM

D. E. Lord 18 Jun. 1973 19 p refs
(Contract W-7405-eng-48)
(UCID-16286) Avail: NTIS HC $3.00

Using the model developed as a result of a strain energy to failure investigation and experimental results from three separate sources for high-purity tantalum, a behavior model fit was accomplished. Tantalum has strengthening peaks that are attributed to interstitial oxygen, nitrogen and hydrogen. Tentative stress-temperature relationships have been established by the model for the temperature range from the cryogenic to 2000 K. These, however, only apply for strain rates greater than .01 per second. The model also seems to be valid for the higher strain rates, but needs verification to extend the ranges beyond room temperature. Not enough data were available to establish the strain variation with temperature, but a very adequate room-temperature strain model was established. This strain model was not affected by the anomalous stress behavior with strain rate, indicating that no structural (phase) change is associated with the stress behavior. Author (NSA)

N74-13254# California Univ., Berkeley. Lawrence Berkeley Lab.

STRUCTURE AND PROPERTIES OF TRIP STEELS PROCESSED BY DEFORMATION AND THERMAL CYCLING M.S. Thesis

H. E. Adkins, Jr. Apr. 1973 52 p refs
(Contract W-7405-eng-48)
(LBL-1491) Avail: NTIS HC $4.75

Strengthening of metastable austenitic chromium-containing TRIP (transformation induced plasticity) steels by thermal and thermomechanical processing was investigated. Three processing treatments were studied for their influence on structure and mechanical properties. A considerable increase in strength resulted from the use of small amounts of deformation by rolling at temperatures near the M sub s temperature to form stress-induced martensite. On heating to an elevated temperature, martensite reverted to austenite by a diffusionless reaction. The reversion was accompained by diffusion-based reactions resulting in the formation of austenite of a lower stability. After repeated cycles of the processing treatments, a fine and uniform structure resulted. Room-temperature yield strengths of steels with the fine structure were much higher than that of annealed austenite, but were lower than those of TRIP steels produced by 80% warm work. Author (NSA)

N74-13255# California Univ., Berkeley. Lawrence Berkeley Lab.

EVALUATION OF THE END-QUENCH TEST AS A DESIGN CRITERION M.S. Thesis

R. N. Lott Jun. 1973 43 p refs
(Contract W-7405-eng-48)
(LBL-1476) Avail: NTIS HC $4.25

End-quench test results have commonly been used to design quenching conditions in the hope that the desired microstructure will be obtained in the quenched piece. Investigation of this

practice shows it to be invalid in principle. The correlation of end-quench data to other quenching conditions is based either on equivalent measured final hardness values or, more generally, on equivalent cooling rates at 1300 F during quenching. The correlation based on equivalent hardness values is invalid because hardness is not a sensitive indication of microstructure or properties of a quenched steel. Correlations based on equivalent cooling rates are not valid because the final properties are shown not to be dependent on the cooling rate at 1300 F during the quench. This is because the final microstructure of a quenched piece depends on the path of the cooling curve through the continuous cooling transformation diagram. The shape of the cooling curve is a function of the quenching conditions and, therefore, its path is not determined by the cooling rate at 1300 F. Author (NSA)

N74-13256# California Univ., Berkeley. Lawrence Berkeley Lab.
AN IRON-NICKEL-TITANIUM ALLOY WITH OUTSTANDING TOUGHNESS AT CRYOGENIC TEMPERATURE
S. Jin, J. W. Morris, Jr., and V. F. Zackay Mar. 1973 20 p refs Presented at Cryogenic Eng. Conf., Atlanta, 8-10 Aug. 1973
(Contract W-7405-eng-48)
(LBL-1484; Conf-730805-3) Avail: NTIS HC $3.00

Research has shown that the alloy Fe-12Ni-0.25Ti may be processed to have an outstanding combination of strength and toughness at cryogenic temperatures. Some of the results obtained to date with this alloy are presented and compared with the properties of two commonly used cryogenic steels. Tensile properties, impact properties, and preliminary results of fracture toughness tests are presented. Author (NSA)

N74-13257# California Univ., Livermore. Lawrence Livermore Lab.
DEPENDENCE OF ACOUSTIC EMISSION OF STRAIN RATE IN 7075-T6 ALUMINUM
M. A. Hamstad and A. K. Mukherjee 29 Jun. 1973 22 p refs Presented at 3d Intern. Congr. on Exptl. Mech. Conf., Los Angeles, 14 May 1973 Revised Sponsored by AEC
(UCRL-74260-Rev-1; Conf-730511-4) Avail: NTIS HC $3.25

The dependence of RMS acoustic emission output on strain rate was determined during tensile tests on 7075-T6 aluminum over a range of strain rates from 0.15 min to 0.230/min. A special normalization technique was developed to eliminate the inherent differences in the acoustic emission from supposedly identical specimens tested under identical conditions. It was found that the RMS acoustic emission output increases approximately linearly with strain rate, and that the slope of the linear dependence decreased with increased plastic strain. The effect of pinned dislocation breakaway on the acoustic emission output versus plastic-strain relationship is the subject of a preliminary theory. Author (NSA)

N74-13258# Oak Ridge National Lab., Tenn.
EFFECT OF THE HYDROSTATIC PRESSURE OF MEDIUM ON THE LONG-TERM STRENGTH OF STEEL
T. D. Voznyi and V. V. Popovich [1973] 5 p refs Transl. into ENGLISH from Fiz.-Khim. Mekh. Mater. (Kiev), v. 8, no. 5, 1972 p 62-64
(ORNL-tr-2710) Avail: NTIS HC $3.00

The effect of an increase to 100 atm of the pressure of bismuth, hydrogen, and lithium on the long term strength of Kh18N10T steel, under strain of a complementary axial force at a temperature of 700 C was studied. To evaluate the effect of increased hydrostatic pressure of the medium, samples were also tested for long term strength with uniaxial tension in an argon atmosphere and in molten bismuth. It is concluded that an increase in the hydrostatic pressure of a liquid metal medium can cause a further decrease in the long term strength of a construction material. NSA.

N74-13259# Scientific Translation Service, Ann Arbor, Mich.
EXPERIMENTAL RESULTS OF SOME FRETTING CORROSION TESTS OF METALLIC MATERIALS
P. Lupoli [1973] 27 p refs Transl. into ENGLISH from the Italian report RT/ING-(72)7 Sponsored by AEC
(AEC-TR-7450; RT/ing-(72)7) Avail: NTIS HC $3.50

A parametric study of fretting corrosion in water was conducted, first on a Cu/steel couple simulating a BWR control rod, and second on Zircaloy-2 on itself and on Inconel. Effects of oscillating frequency, contact pressure, oscillation amplitude contact materials, passivation, and ambient medium (air or N2) were studied. NSA

N74-13260# Battelle Columbus Labs., Ohio.
PART-THROUGH-CRACK BEHAVIOR IN THREE THICKNESSES OF MILL-ANNEALED Ti6Al-4V PLATE Final Report
Charles E. Feddersen, Theodore L. Porfilio, Richard C. Rice, and Walter S. Hyler 31 Dec. 1972 95 p refs
(Contract N61169-72-C-0036)
(AD-767064; Avail: NTIS CSCL 11/6

Part-through crack behavior has been evaluated in one quarter, one half and one-inch thicknesses of mill-annealed Ti-6Al-4V plate. Constant-amplitude fatigue-crack propagation, overload-crack retardation, near-fracture crack extension, and critical fracture or residual strength were the four aspects of crack behavior considered. The near-fracture crack extension studies demonstrate that over the finite range of thickness considered, the region of critical crack instability occurs at the extremes of the crack length dimension, rather than at the depth as postulated by classical elastic concepts. This supports the representation of fracture data by a semiempirical approach outlined herein. In general, it appeared that toughness can be characterized by simple formulations of the stress-intensity factor, excluding the back surface correction. However, the back surface correction was a necessary transformation to achieve a smooth transition of fatigue-crack-propagation behavior during breakthrough of the back surface. (Modified author abstract) GRA

N74-13261# Massachusetts Inst. of Tech., Cambridge. Casting and Solidification Section.
HIGH STRENGTH ALUMINUM ALLOYS PREPARED BY IMPROVED SOLIDIFICATION TECHNIQUES Final Technical Report, 1 Nov. 1971 - 31 Oct. 1972
Robert Mehrabian, Diran Apelian, Rodney G. Riek, Min-Hsiug Tsai, and Merton C. Flemings Jun. 1973 106 p refs
(Contract DAAG25-72-C-0171)
(AD-767304) Avail: NTIS CSCL 11/6

The research is presented in three parts. (1) Filtration of Aluminum Alloys - The effectiveness of various filter media in removing oxide particles and synthetic inclusions such as TiB2 from aluminum alloys was investigated. Results showed that by proper choice of filters, particles of different sizes can be effectively filtered from aluminum alloys. Pressures required for metal flow through the smallest pore filters were less than 60 psi. (2) Specific Permeability of Partially Solidified Dendritic Networks of Al-Si Alloys - Segregated interdendritic liquid was successfully removed from partially solidified Al-Si alloys. Porous columnar, equiaxed and grain refined dendritic networks of the alloys were prepared. Specific permeabilities of the porous dendritic networks were measured using a triaxial cell permeameter. For equivalent volume fraction solid, the permeabilities of the grain refined samples were found to be lower than those of the non-grain refined samples. Flow through the partially solid non-grain refined samples obeyed D'Arcy's law. (3) Casting of Aluminum Alloy - Particulate Ceramic Composites - A new process for the preparation and casting of metal-ceramic composites is described. Particulate composite end chill plates containing Al2O3, SiC or glass beads in an Al-Si-Fe alloy matrix were successfully prepared. These plates exhibited good abrasion resistance and improved hardness. Author (GRA)

N74-13262# Northrop Corp., Hawthorne, Calif. Aircraft Div.
DEVELOPMENT AND EVALUATION OF METHODS OF PLANE STRESS FRACTURE ANALYSIS. PART 1: REVIEW AND EVALUATION OF STRUCTURAL RESIDUAL STRENGTH PREDICTION TECHNIQUES Final Report, Jul. 1972 - Feb. 1973
Ralph M. Verette and David P. Wilhem May 1973 114 p refs
(Contract F33614-72-C-1789)
(AD-767614; NOR-72-32-Pt-1; AFFDL-TR-73-42-Pt-1) Avail: NTIS CSCL 11/6

The treatment of residual strength prediction for aircraft structures having through flaws is considered in this report. A

discussion of the circumstances which normally give rise to plane stress or mixed mode fracture is presented along with a summary of those elements which would constitute an ideal residual strength method. This method would be capable of prescribing the remaining strength possessed by a broad variety of flawed aircraft structures under actual service environments. Currently available prediction techniques fall considerably short of the desired goal, and the strong and weak points of existing methods, as well as comparisons with test results, are presented. A recommended technique is described for residual strength prediction which bridges the gap between the existing methods and the ideal. The recommended approach will account for slow crack growth and plasticity. It appears that the apporach will utilize the J integral in combination with a modified form of the crack growth resistance curve in making residual strength predictions.
Author (GRA)

N74-13263# Boeing Commercial Airplane Co., Seattle, Wash.
EVALUATION OF AFC 77 MARTENSITIC STAINLESS STEEL FOR AIRFRAME STRUCTURAL APPLICATIONS Final Technical Report, 1 Jun. 1971 - 31 May 1973
R. G. Caton and C. S. Carter Sep. 1973 75 p refs
(Contract F33615-71-C-1550; AF Proj. 7351)
(AD-767597; D6-60225; AFML-TR-73-182) Avail: NTIS CSCL 11/6

The fabrication and properties of two high-strength stainless martensitic steel forgings are described. A high level of fracture toughness was achieved in the AFC 77 forging at a tensile strength level of 235 ksi. Stress corrosion resistance, however, was similar to that of competitive steels. The fracture toughness, stress corrosion, and fatigue properties developed in the AFC 77B forging at a tensile strength of 260 ksi were similar to those of currently used steels. Cracking problems were experienced with both forgings during heat treatment. The stress corrosion resistance of AFC 77 was no higher than that of competitive steels. The target tensile strength of 275 ksi was not achieved in the AFC 77B landing gear forging. A lower tensile strength would appear to be more appropriate for this alloy in heavy section form. The fracture toughness, stress corrosion, and notch fatigue properties were very similar to those of medium alloy steels. Although both AFC 77 and AFC 77B are stainless types of steel, it is considered that the low stress corrosion resistance would necessitate plating and painting to prevent the ingress of moisture. (Modified author abstract) GRA

N74-13264# Rohr Corp., Chula Vista, Calif.
DEVELOPMENT OF A FILLER METAL AND JOINING PROCESS FOR TITANIUM-ALLOY HONEYCOMB PANELS Final Report, Jul. 1971 - May 1973
J. R. Woodward Wright-Patterson AFB, Ohio AFML Jul. 1973 144 p
(Contract F33615-71-C-1888; AF Proj. 7351)
(AD-767227; AFML-TR-73-125) Avail: NTIS CSCL 11/6

The second generation beta titanium alloys, Beta III, RMI 38-6-44 and TMCA 88-23, were furnished in foil and fabricated into honeycomb core. All three alloys responded well to the core manufacturing process. Thermal effect studies showed that all of the beta titanium alloys were relatively unaffected by high temperature, long time exposures when in foil form. Sheet forms resulted in grain growth under the same conditions. The Rohr Industries, Inc. proprietary LID(TM) bonding process showed the highest strength joints of all other systems tested. Sandwich panels made with the three beta titanium cores bonded to Ti 6Al 4V faces were measured in all sandwich test modes. The data were compared with sandwich structure made with the same joining system except with Ti 3Al 2.5V core. Results showed that significant strength improvements can be realized by using beta titanium core. Projections also show that material cost economies may be realized by using beta titanium core.
Author (GRA)

N74-13265*# Parametrics, Inc., Waltham, Mass.
DEVELOPMENT OF SELF-CONTAINED PORTABLE UNIT FOR NONDESTRUCTIVE COMPOSITIONAL ANALYSIS OF AIRCRAFT AND SPACE SYSTEMS ALLOYS Final Technical Report, 1 Jul. 1971 - 31 Mar. 1973
Joris M. Brinkerhoff Jul. 1973 35 p refs
(Contract F33615-71-C-1897; AF Proj. 7360)
(AD-767226; AFML-TR-73-181) Avail: NTIS CSCL 11/6

Two portable radioisotope excited X-ray fluorescence systems have been designed and delivered, one a high resolution type using a cryogenically cooled solid state detector and the other a gas filled proportional counter operated in conjunction with balanced X-ray filters. The measurement probes were designed for sample areas that may be of small size or that may occur in recessed locations. Measurement techniques were formulated and studied that use pure elemental standards in conjunction with just a single alloy reference for a given unknown. Computational programs were written to implement these techniques. A set of twenty-seven analyzed reference alloys was also provided. This report summarizes the design aspects of the two systems and the course of evaluation of the measurement techniques.
Author (GRA)

N74-13266# California Univ., Berkeley. Lawrence Berkeley Lab.
AN INVESTIGATION OF METALLURGICAL FACTORS WHICH AFFECT FRACTURE TOUGHNESS OF ULTRAHIGH STRENGTH STEELS Final Report, 26 Jun. - 26 Dec. 1972
William E. Wood, Earl R. Parker, and Victor F. Zackay May 1973 96 p refs
(Contracts DAAG46-72-C-0220; W-7405-eng-48; DA Proj. 1T0-61101-A-91A)
(AD-767270; LBL-1474; AMMRC-CTR-73-24) Avail: NTIS CSCL 11/6

The relationship between microstructure, heat treatment and room temperature fracture toughness has been determined for the low alloy ultra-high strength steels 4130, 4330, 4340, 4140 and 300-M. Optical metallography, microprobe analysis, and scanning electron microscopy were used to characterize the structure and morphology, while both Charpy V-notch impact tests and plane strain fracture toughness tests were used to determine the fracture properties. The normal commercial heat treatment resulted in the formation of some bainite in all the alloys. MnS inclusions on prior austenite grain boundaries were found to initiate cracks during loading. By increasing the austenitizing temperature to 1200C, the fracture toughness could be increased by at least 60%. For some alloys increasing the severity of the quench in conjunction with the higher austenitizing temperatures resulted in further increases in the fracture toughness, and the elimination of any observable upper bainite. There was no correlation between the Charpy impact test results and the fracture toughness results. (Modified author abstract)
GRA

N74-13267# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Materials Directorate.
RAPID HEATING AND LOADING OF 250- AND 300-GRADE MARAGING STEEL
John H. Honeycutt Aug. 1973 33 p
(DA Proj. 1T1-62105-A-328)
(AD-767532; RL-TR-73-5) Avail: NTIS CSCL 11/6

The purpose of this report is to make available to the design engineer tensile property date on 250- and 300-grade maraging steel, in the longitudinal direction, under conditions of rapid heating and loading. The tensile property data reported are: ultimate tensile stress, ultimate yield stress (at 0.2-percent offset), elastic modulus, percent total elongation, and percent uniform elongation. These tensile properties were determined at a strain rate of 0.005 in./in./sec and at temperatures of 78 (RT), 250, 500, 750, 1000, and 1250F. The time required to reach test temperature was, in most cases, less than 10 seconds. Primary consideration is given to ultimate tensile and yield properties. Other tensile property data reported are secondary and should be used for design criteria only after consideration has been given to the methods used for obtaining and reducing these data.
GRA

N74-13268# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
THE ROLE OF PASSIVE FILM GROWTH KINETICS AND PROPERTIES IN STRESS CORROSION AND CREVICE CORROSION SUSCEPTIBILITY Technical Summary Report
J. Kruger and J. R. Ambrose Jul. 1973 76 p refs
(Contract NAonr-18-69; NR Proj. 036-082)
(AD-767326; NBSIR-73-244; TSR-4) Avail: NTIS CSCL

11/6

The early stages of crevice corrosion of AISI 304 stainless steel in 1.0N NaCl solution have been detected using the ellipsometer to measure changes in optical properties occurring within the crevice between a polished metal surface and a glass plate. Changes in the ellipsometer parameters begin almost immediately upon creation of the crevice and can be interpreted as resulting from a build-up of soluble species within the crevice solution, followed by an overall thinning of the protective film and general corrosion attack. Such optical changes could not be reproduced by deoxygenation of the bulk solution without the presence of a crevice nor were they observed during experiments using a Ti-8Al-1Mo-1V alloy, which is not susceptible to crevice corrosion in the 1.0N NaCl at room temperature. Author (GRA)

N74-13269# Naval Research Lab., Washington, D.C.
SUSTAINED-LOAD CRACKING OF TITANIUM: A SURVEY OF 6Al-4V ALLOYS Final Report
G. R. Yoder, C. A. Griffis, and T. W. Crooker 24 Aug. 1973 26 p refs
(RR0220146)
(AD-767307; NRL-7596) Avail: NTIS CSCL 11/6

This survey reveals that degradation in load-carrying capacity owing to sustained-load cracking (SLC) is widespread and serious in alloys of the Ti-6Al-4V family. Each of eight different one inch (2.5-cm) thick plates tested in air at room temperature exhibited the effect, with degradations ranging up to 35%. The amount of degradation does not seem to correlate with differences in hydrogen content, processing variables, or strength and toughness levels; however, the susceptibility to SLC is orientation dependent. Invalidity of several of the rising-load fracture toughness values, with respect to plane-strain criteria, makes quantitative comparison of degradations uncertain. However, the threshold stress-intensity factor below which SLC failures will not occur, K_{Ith}, clearly represents a more conservative fracture-safe design parameter than the plane-strain fracture toughness K_{Ic}, which cannot account for insidious time-delayed failures owing to SLC. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-13270* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEPOSITION OF ALLOY FILMS Patent
Talivaldis Spalvins, inventor (to NASA) Issued 13 Nov. 1973 4 p Filed 21 Apr. 1971 Supersedes N71-34455 (10 - 21, p 3437)
(NASA-Case-LEW-11262-1; US-Patent-3,772,174; US-Patent-Appl-SN-136008; US-Patent-Class-204-192) Avail: US Patent Office CSCL 11F

An invention is described which deposits metal alloy films on a metal object. A glow discharge is established by applying a high voltage between an anode and a cathode object disposed in an inert gas atmosphere. An alloy of two or more metals is vaporized and the vapor injected into the glow discharge causing the alloy to be plated onto the cathode object.
Official Gazette of the U.S. Patent Office

N74-13271 British Library Lending Div., Boston Spa (England).
THE MAGNETIC PROPERTIES OF INTERMETALLIDES CONTAINING RARE EARTH ELEMENTS
A. A. Volskii, V. S. Kraposhin, B. G. Livshits, Ya. L. Linetskii, and A. N. Savich 1973 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (Moscow), v. 4, 1973 p 139-141 In ENGLISH and RUSSIAN
(BLL-M-21735-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl: 1 BLL photocopy coupon

The effects of the chemical composition of powdered praseodymium, samarium, cobalt alloys and the pulverizing time on the coercive force, saturation magnetization, and residual magnetization of the alloys were investigated. When praseodymium is replaced by samarium, there is a steady increase in coercive force and a drop in saturation magnetization. The hysteresis properties of the alloy can be altered within wide limits by changing the compositions of the ternary compounds.
Author

N74-13272 British Library Lending Div., Boston Spa (England).
SUPER FIBRES OF POLYAMIDES ON AN INDUSTRIAL OR SEMI-COMMERCIAL SCALE
M. Russo 3 Sep. 1973 27 p Transl. into ENGLISH from Materie Plasticheed Elastomeri (Italy), v. 38, no. 4, 1972 p 315-323
(BLL-DRIC-Trans-3216-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The development and application of super fibers of polyamides for industrial and semi-commercial purposes are discussed. The fibers are capable of retaining their mechanical and chemical integrity both during and after exposure to temperatures above 200 C for prolonged periods. The main advantages of super fibers are: (1) low density, (2) high degree of flexibility, and (3) easy adaptation to existing textile technology. Emphasis is placed on super fibers derived from heat resistant polyamides and polyamidoimides. Author

N74-13273 British Library Lending Div., Boston Spa (England).
FORMATION OF CARBIDE COATINGS IN A GLOW DISCHARGE
G. D. Kuznetsov and A. A. Badad-Zakhryapin [1973] 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), No. 3, 1973 p 121-124 In ENGLISH and RUSSIAN
(BLL-M-21720-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The process by which coatings of carbides of niobium, tantalum, zirconium, and titanium in graphite and in steel formed during the dissociation of the chlorides of the metals concerned in glow discharges was investigated. The application of glow discharge lowers the temperature at which the chlorides of niobium and tantalum dissociate and increases the rate at which a layer of carbides forms. The law for the growth of the carbide coating is governed by the kinetics of the precipitation of the free metal, which depend on the specific power of the discharge. The layer grows by linear law in the region in which the free metal is stable, and by an almost parabolic law in the region in which it is unstable. Author

N74-13274 British Library Lending Div., Boston Spa (England).
A MICROTRIBOMETRIC STUDY OF SELF-LUBRICATING COMPOSITIONS ON THE BASIS OF POLYMERS
A. I. Sviridenok, V. M. Kenko, and V. A. Belyi 5 Jul. 1973 11 p refs Transl. into ENGLISH from Mekh. Polim. (Latvian SSR), v. 1, 1973 p 102-104
(BLL-Risley-TR-2654-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A microtribometric method for determining the frictional properties of polymers and composite materials based on the polymers was developed. The use of microtribometry for the study of self lubricating composites on the basis of polymers and dry lubricants is stressed. An analysis of requisite frictional properties makes it possible to select the materials, determine the dispersion, and assess the mechanism of composite self lubricating materials. Author

N74-13275 British Library Lending Div., Boston Spa (England).
QUICK DRYING INHIBITED COATINGS FOR THE TEMPORARY PROTECTION OF METAL FROM CORROSION
I. L. Rozenfeld, I. A. Efimenko, F. I. Rubinshtein, and D. Ya. Gusakova Sep. 1973 11 p refs Transl. into ENGLISH from Lakokrasochnye Materialy i ikh Primenonie (Leningrad), v. 5, 1969 p 13-16
(BLL-RTS-8412) Avail: British Library Lending Div., Boston Spa.

Engl.: £1.00 or 3 BLL photocopy coupons

A method for producing quick drying inhibited coatings of polymers for protecting metals from corrosion is discussed. One method uses glyptal resins with a quick drying polymeric material such as nitrocellulose. A comparative investigation of the physico-chemical and protective properties of inhibited nitroglyptal coatings showed their superiority. The method for conducting the tests and the results obtained under various conditions are described. Author

N74-13276 British Library Lending Div., Boston Spa (England).

GAS-PERMEABILITY OF FUSED QUARTZ GLASS

V. A. Kalinchev Oct. 1973 5 p refs Transl. into ENGLISH from Svetotekhnika (Moscow), no. 1, 1972 p 13-14

(BLL-RTS-8535) Avail: British Library Lending Div., Boston Spa, Engl.: £0.40; 1 BLL photocopy coupon

The diffusive permeability of fused quartz glass was investigated to determine the application to gas filled and vacuum devices. The varying permeability of fused quartz is plotted as a function of temperature. A table of data for the coefficient of gas permeability of various gases is provided. The diffusion mechanism of the glass are defined by the action of three groups of factors: (1) physico-chemical pf the material, (2) the physico-chemical properties of the diffusive gas, and (3) the characteristics of the external conditions accompanying the diffusion process. Author

N74-13277 British Library Lending Div., Boston Spa (England).

NONDESTRUCTIVE TESTING OF FIBRE-REINFORCED PLASTICS. 4: NONDESTRUCTIVE TESTING USING THERMAL AND OPTICAL RAYS

I. Kanahara Oct. 1972 20 p refs Transl. into ENGLISH from Purasuchikkusa (Tokyo), v. 23, no. 8, 1972 p 135-140

(BLL-RTS-8334) Avail: British Library Lending Div., Boston Spa, Engl.: £1.90; 6 BLL photocopy coupons

Nondestructive testing of fiber reinforced plastics using electromagnetic waves is discussed. The methods include the use of thermal rays, optical rays, microwaves, and reflected X-ray and gamma ray energy. A method involving the use of laser holographs for nondestructive tests is described. Emphasis is placed on the use of thermal rays and optical methods using the application of optical rays. Author

N74-13278 Missouri Univ., Columbia.

A STUDY OF THE FIELD IONIZATION CHARACTERISTICS OF GRAPHITE FILAMENTS Ph.D. Thesis

George David Moore 1972 78 p

Avail: Univ. Microfilms Order No. 73-21462

The field ionization characteristics of three graphite filaments were studied at constant pressure and at constant voltage with ethylene and ammonia. The gage pressure measurements were converted to absolute pressures from a consideration of the relative sensitivity of the ionization gauge. The constant pressure measurements established that the ion yield from both gases was a linear function of pressure from .0000063 torr to .000032 torr for ethylene and .000014 torr to .00006 torr for ammonia at voltages from 7 to 13 kV. The ion currents measured at constant pressure were normalized to the pressure and lengths of the graphite filaments. The resulting data were used in a linear regression analysis to determine empirical ion yield equations for both gases. The applied voltage was converted to applied field by a consideration of the evaporation field for graphite. Finally, all data including the ion yield equations are presented in terms of the absolute pressure and the applied electric field to allow for direct comparison with future experiments or theoretical calculations. Dissert. Abstr.

N74-13279+ Compagnie Generale d'Electricite, Marcoussis (France). Dept. Recherches Physiques de Base.

BARIUM SODIUM NIOBATE, AND LEAD MOLYBDATE PREPARATION PERFECTION Final Report [MISE AU POINT DE LA FABRICATION DU NIOBATE DE BARYUM ET DE SODIUM ET DU MOLYBDATE DE PLOMB RAPPORT FINAL]

Jean-Pierre Dumas, Gerard Villela, and Jean-Yves Boniort 18 Nov. 1971 40 p In FRENCH

(Contract DGRST-70-02-170)

Avail: NTIS HC $4.00

The Czochralski method was used to obtain single crystals of barium sodium niobate (NaBa2Nb5015) and of lead molybdate by extraction from their melts. In the niobate crystal the presence of ferroelectric domains was shown. The domains could be reversed by applying an electric tension. The macles were removed by heating the crystal just below the allotropic conversion temperature. The characteristics of the molybdate crystal were established by X-ray and optical methods. Purity was checked with mass spectrography. The acousto-optical properties were also determined. ESRO

N74-13280# Research Inst. of National Defence, Stockholm (Sweden).

LUBRICATING MATERIAL FOR EXTREME CONDITIONS [SMORJMEDEL FOR EXTREMA FORHALLANDEN]

Goran Aqvist Nov. 1971 31 p refs In SWEDISH

(FOA-1-A-1539-F8/G1/D1) Avail: NTIS HC $3.75

The summary first gives examples of the different extreme conditions in the form of temperature, pressure, radiation and the surrounding medium which are to a high degree met by technically developed lubricants. The requirements which cannot be met by mineral based oils as lubricants, are described. Then follows an account of the structure, properties and field of application for a series of synthetic and solid lubricants. Liquid metals, water and gases as lubricants are also discussed. Applications are taken from flight, space and nuclear energy techniques. Author

N74-13281# Bendix Corp., Kansas City, Mo.

ALUMINUM PLATING GRAPHITE FIBERS AND BERYLLIUM WIRE

F. A. Clay Aug. 1973 19 p refs Revised

(Contract AT(29-1)-613)

(BDX-613-865-Rev) Avail: NTIS HC $3.00

Metal-matrix composites required continuous lengths of aluminum-coated graphite fibers and aluminum-coated beryllium wire. Although short lengths of graphite fibers were successfully plated with aluminum using a CVD batch process, continuous plating was not accomplished because of insufficient process control. A fixture and process were developed for the continuous electroplating of 0.005-inch diameter beryllium wire. A diethyl ether aluminum plating bath was used. Continuous lengths up to 20,000 feet were plated. A total of 505,000 feet were processed. Author (NSA)

N74-13282# Los Alamos Scientific Lab., N.Mex.

COMPRESSIVE LOAD-DEFLECTION CHARACTERISTICS OF SEVERAL MATERIALS AT ROOM TEMPERATURE 77 K AND 4.2 K

W. F. Stewart, D. T. Eash, and W. A. May 1972 20 p refs Presented at Cryogenic Eng. Conf., Atlanta, 8-10 Aug. 1973

(Contract W-7405-eng-36)

(LA-UR-73-391; Conf-730805-5) Avail: NTIS HC $3.00

The compressive load-deflection characteristics of several flexible foam materials and a low density rigid styrofoam were determined at room temperature, 77 K and 4.2 K. A flexible foam is used to avoid highly localized loading of the cryostat inner shell by the laternal support system of a superconducting coil experimental model of a pulsed plasma thermonuclear fusion energy source. The flexible foam materials that were tested became extremely rigid at the lower temperatures, but returned to their original flexible condition upon warming to room temperature. The compressive load-deflection characteristics of the materials tested are presented. Author (NSA)

N74-13283# California Univ., Berkeley. Lawrence Berkeley Lab. Inorganic Materials Research Div.

[INORGANIC MATERIALS RESEARCH INCLUDING CHEMISTRY, METALLURGY, CERAMICS, AND SOLID STATE PHYSICS] Annual Report, 1972

Apr. 1973 231 p refs

(Contract W-7405-eng-48)

(LBL-1400) Avail: NTIS HC $7.60

Very brief summaries of individual studies are reported under the sections of four major areas as follows: (1) chemistry - inorganic chemistry, electrochemistry, solid-state chem-

istry and physics, physical chemistry, and nuclear science; (2) metallurgy - crystal imperfections, relationship of microstructure and properties, high-voltage electron microscopy, alloy design, high-field superconductivity, powder metallurgy, thermodynamics of metal systems, and advanced materials; (3) ceramic science - high-temperature reactions, microstructure and behavior of ceramic materials, and relationship of microstructure to properties; and (4) solid-state physics - theoretical solid-state physics, far-infrared properties of solids, superconductivity, and experimental solid-state physics and quantum electronics. Practically all of the information had been published in detail, and a list of 1972 publications and reports follows each section. Administrative information is also given. NSA

N74-13284# Fiber Materials, Inc., Biddeford, Maine.
FABRICATION OF ALUMINUM-GRAPHITE COMPOSITES Final Report, May 1972 - May 1973
Roger T. Pepper, Robert A. Penty, and Stephen J. Allen Jul. 1973 51 p refs
(Contract DAAG46-72-C-0180)
(AD-767267; AMMRC-CTR-73-25) Avail: NTIS CSCL 11/4

Aluminum-graphite composites have high potential for use in weight critical structures requiring materials of high strength and stiffness to density ratio. Aluminum and graphite are potentially cheap raw materials, ahp aluminum-graphite composites offer the attractive prospect of low cost. A continuous liquid metal infiltration process has recently been developed for making composite wire from commercially available multifiber graphite yarns. Composite wire has been made from Thornel 50 infiltrated with Al3, 220 and 6061 alloys. Aluminum alloy-graphite composite shapes have been successfully fabricated by hot-pressing the composite wire. Mechanical testing of both the composite wire and hot-pressed bars includes longitudinal and transverse tensile, flexural and compressive strengths and elastic modulus. The longitudinal tensile strength and elastic modulus of both the composite wire and hot-pressed bars approximated rule of mixtures behavior. Examination of the microstructure indicates that better transverse strength may be achieved through refinement of the matrix grain size, elimination of continuous networks of intermetallic compounds, and homogenization of the alloy constituents of the matrix. (Modified author abstract) GRA

N74-13285# Naval Research Lab., Washington, D.C.
SOLUTION GRAPHS: SIMPLE ALGEBRAIC STRUCTURES FOR PROBLEMS IN LINEAR ANISOTROPIC ELASTICITY Final Report
P. W. Mast 18 Sep. 1973 33 p refs
(AD-767642; NRL-7577) Avail: NTIS CSCL 11/4

The use of directed graphs to explicitly state the structure of solutions in plane linear anisotropic elasticity aids research into the strength and failure of composite materials by providing a visible structure for: recording available solutions, adding on new solutions, and selecting useful solutions for the problem of finding functions on the composite structure whose critical values are load and geometry invariant. Further aid is given by recent developments in tensor manipulations in complex coordinates, the mechanics of which are included as an appendix. The solution graphs (directed graphs) for the anisotropic half plane and for the contact of dissimilar anisotropic half planes are presented. Author (GRA)

N74-13286# Frankford Arsenal, Philadelphia, Pa.
FUNGUS RESISTANCE OF POLYVINYL ACETATE LATEX DUST CONTROL MATERIAL
Leonard Teitell and Sidney H. Ross Jun. 1973 18 p refs
(DA Proj. 1T0-62105-A-329)
(AD-767256; FA-M73-19-1) Avail: NTIS CSCL 11/9

A polyvinyl acetate latex material, intended for use as a dust control material for helicopter landing pads, was evaluated for fungus susceptibility. Laboratory tests included incubation of dried films on inorganic salts-agar and burial of specimens in biologically active soil. The dried films show a marked loss in flexibility, probably due to use of plasticizer by soil microorganisms. The dried films can be protected against fungus attack by the addition of a biocide such as 2, 3, 5, 6-tetrachloro-4 (methylsulfonyl) pyridine to the latex material prior to casting the films. Examination of drums of liquid dust control material stored in the tropical climate of the Canal Zone showed evidence of microbiological contamination of the liquid latex. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categoriesj For related information see also: 08 Computers.

N74-13287 Cornell Univ., New York.
ADJUSTMENT OF AERIAL TRIANGULATION USING ORTHOGONAL TRANSFORMATIONS Ph.D. Thesis
Guirguis Fahmy Yassa 1973 138 p
Avail: Univ. Microfilms Order No. 73-22546

The problem of aerial triangulation adjustment, is viewed as a statistical estimation problem, which involves point estimation as well as interval estimation. The mathematical models of aerial triangulation adjustment can be derived from a common starting point, namely, the projective relationships. They can be reduced eventually to a linear statistical model, namely a functionally related model with measurement errors. The Schmid-Brown mathematical model for bundle adjustment was taken as a basis for this reduction. The reduction of the mathematical models of aerial triangulation to the form of a linear statistical model is useful in many respects. The analysis of errors associated with any adjustment model is rendered easier, as all information about errors is contained in the error vector. Approximate models may be viewed as models with an equation error. Dissert. Abstr.

N74-13288*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A PROPOSAL FOR STANDARD LINEAR ALGEBRA SUBPROGRAMS
R. J. Hanson (Washington State Univ.), F. T. Krogh, and C. L. Lawson 15 Nov. 1973 19 p refs
(Contract NAS7-100)
(NASA-CR-136216; JPL-TM-33-660) Avail: NTIS HC $3.00 CSCL 12A

A set of FORTRAN callable subprograms are proposed which will be useful in the development of efficient portable ANSI FORTRAN subprograms and applications programs in the area of linear algebra. Author

N74-13289# Research Inst. of National Defence, Stockholm (Sweden).
SOME ASPECTS ON CONFIDENCE REGIONS
Ola Hertzberg Jan. 1972 24 p refs
(FOA-1-B-1221-M4) Avail: NTIS HC $3.25

Confidence regions for parameter estimates in dose-mortality curves are examined. Two parameters, alpha and beta, were calculated from a rectangular acceptance region. Data show that: (1) confidence regions deduced from retangular regions of acceptance could take most geometrical shapes due to different functional relations between the parameters and estimates, and (2) prior information about the size of the parameters or about their relationship in size could influence the confidence region. Fieller's theorem is used to calculate confidence intervals for the ratio of two parameters whose estimates are normally distributed. E.H.W.

N74-13290# Research Inst. of National Defence, Stockholm (Sweden).
DHAMDI: A FORTRAN SUBROUTINE TO INTEGRATE A SET OF FIRST ORDER, ORDINARY DIFFERENTIAL EQUATIONS CONTAINING DISCONTINUITIES
Goeran Fick Nov. 1971 23 p refs
(FOA-2-C-2504-E5) Avail: NTIS HC $3.25

A double precision FORTRAN subroutine is presented that will integrate a set of first order, ordinary, differential equations that may contain discontinuities in the derivatives occuring at not a priori known values of the independent variable. It is a modification of a well-known SSP-subroutine using Hammings predictor-corrector algorithm. Author

N74-13291# Royal Inst. of Tech., Stockholm (Sweden). Mathematics Dept.
THE SYSTEMS STRUCTURE AND THE EVALUATION OF FUTURE TRENDS IN A STUDY OF SULFUR AS AN ENVIRONMENTAL POLLUTANT
Lars Ingelstam 1972 44 p refs
(PT-1972:1) Avail: NTIS HC $4.25

The environmental impact of sulfur and sulfur precipitation in the atmosphere is investigated. Data cover damage to vegetation, biological effects, corrosion, and technological costs of reducing sulfur concentrations. E.H.W.

N74-13292*# California State Univ., Fullerton.
ANALYSIS AND OPTIMIZATION OF CYCLIC METHODS FOR APPLICATION IN ORBIT COMPUTATIONS
Sam Pierce Jul. 1973 46 p refs Submitted for publication
(Grant NGR-05-071-005)
(NASA-CR-132826) Avail: NTIS HC $4.50 CSCL 12A

The class of cyclic methods, which includes the traditional methods, for numerically solving first and second order ordinary differential equations are mathematically and computationally analyzed and their error growth is minimized for application to orbit computation problems. Author

N74-13293# California Univ., Livermore. Lawrence Livermore Lab.
CONSTRUCTION OF MATHEMATICAL SOFTWARE. PART 4: NONLINEAR LEAST SQUARES CODES
Brad Johnston Jan. 1973 81 p refs
(Contract W-7405-eng-48)
(UCID-30050-Pt-4) Avail: NTIS HC $6.25

The following chapters are included: (1) elementary statistics, (2) the least-squares problem, (3) the univariate algorithm, (4) the gradient search algorithm, (5) Gauss's method, and (6) the Levenberg-Marquardt algorithms. NSA

N74-13294# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
IDENTIFICATION METHODS DEVELOPED AT LAAS APPLIED TO A POLYMERIZATION PRODUCTION UNIT Annual Report [APPLICATION A UNE UNITE INDUSTRIELLE DE POLYMERISATION DES METHODES D'IDENTIFICATION DEVELOPPEES AU LA.A.S.]
G. Continente Mar. 1973 84 p refs In FRENCH Sponsored in part by Soc. Natl. des Petroles d'Aquitaine
(LAAS-AS-73-I-10) Avail: NTIS HC $6.25

A dynamic model for a polystyrene prepolymerization reactor was established for adaptive control by computer. The industural process is presented. The notion of mathematical models is defined and some models are given. The identification methods applied to linear model parameters using input-output observations are introduced. The algorithms are applied to the evaluation of delayed time model parameters. Identification methods to be used in real time are proposed. New methods of linear stochastic control as well as their possibilities are outlined. ESRO

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-13295 Illinois Univ., Urbana.
AN ANALYSIS OF ATMOSPHERIC TEMPERATURE, PRESSURE, WINDS, AND SEA SURFACE TEMPERATURE, SUMMER 1970, AT CAPE MENDOCINO, CALIFORNIA Ph.D. Thesis
Gerald Paul Hannes 1972 299 p
Avail: Univ. Microfilms Order No. 73-172-29

The atmospheric variables of pressure and temperature, and sea surface temperatures collected during the summer of 1970 in the Cape Mendocino area of northern California were analyzed with the aid of factor analysis to note any existing relationships among these variables chosen for study. Because of differences in sampling intervals, the data examined had to be placed in two different formats for analysis: (1) selected actual hourly values, and (2) hour-to-hour change values. Furthermore, hour-to-hour atmospheric pressure and temperature change values were examined to note any possible lunar declinational cyclic organization in their respective summer distributions. The results of the study indicate a series of complex interrelationships between the various atmospheric variables and sea surface temperatures throughout the day. In addition, the summer distributions of morning atmospheric pressure change and temperature change were examined and found to exhibit different organizations with respect to the north and south lunar declinational cycles than did those of the evening hours studied. Dissert. Abstr.

N74-13296 British Library Lending Div., Boston Spa (England).
THE INFLUENCE OF RELIEF ON THE DISTRIBUTION OF SMOKE-DEPOSITS FROM THEIR SOURCES
M. E. Berlyand, E. G. Genikhovich, and O. I. Kurenvin [1973] 27 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (USSR), v. 234, 1968 p 28-44 In ENGLISH and RUSSIAN (BLL-M-23167-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

Studies of the atmospheric diffusion of impurities have for the most part referred to conditions where the underlying land surface was comparatively even and horizontally uniform. In real conditions, conurbations and industrial installations are frequently situated on broken ground. Unevenesses in the underlying land surface cause distortion in the structure of the air streams and can therefore lead to changes in the distribution of the concentrations of impurities from their sources. The analysis of these changes is extremely difficult, since it involves the solution of a problem which is both mathematically and physically complex. However, for an approximate investigation it is possible to introduce a number of simplifications, employing methods of solution used in corresponding problems in hydrodynamics and the physics of the ground layer of the atmosphere. The basis of this investigation is a numerical solution of the equation of turbulent diffusion in a zone having curvilinear boundaries.
Author

N74-13297 British Library Lending Div., Boston Spa (England).
STATISTICAL FORECASTING OF MEAN ATMOSPHERIC POLLUTION
A. Kaspshiski [1973] 5 p Transl. into ENGLISH from Glav. Uprav. Gidromet. Sluz. (Leningrad), 1971 p 82-85
(BLL-M-22906-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The possibility is discussed of forecasting the mean pollution of the atmosphere based on forecast values of meteorological paramaters such as wind direction and speed, daily rainfall, eight and thickness of inversions, etc. Results are presented of work based on a statistical analysis of measurements of mean daily dust concentration for the period 1963 to 1965, for the network of stations of the State Hydrometeorological Institiute.
Author

N74-13298 British Library Lending Div., Boston Spa (England).
USE OF RADAR FOR QUANTITATIVE PRECIPITATION FORECAST
Ken Nanasawa [1973] 12 p refs Transl. into ENGLISH from Tokyo, Weather (Japan), bull. 16, 1972 p 376-382
(BLL-M-23008-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Quantitative forecasts of precipitation after the observation of radar echoes were investigated, in the Oshima Peninsula of Hokkaido, for the period of June to August 1969. Correlation diagrams between radar echo intensity and precipitation three hours afterward were prepared. Rainfall distribution estimated from this diagram and actual rainfall distribution were compared. It was found that useful data for forecasting are obtainable, if the overall echo pattern is considered. Author

N74-13299 British Library Lending Div., Boston Spa (England).
BACKSCATTER STUDIES IN FOG USING LASER TECHNIQUE

H. S. Helbig [1973] 21 p Transl. into ENGLISH of West German report DFVLR-70-31, Munich, 1970
(BLL-M-23108-(5828.4F); DFVLR-70-31) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The optical laser is discussed as a meteorological tool for determining visibility in fog. The scattering properties of fog, and the location of targets in fog are discussed, and the design and construction of the laser transmitter and receiver are described. It is concluded that the laser instrument is suitable for measuring local visibilities in fog. F.O.S.

N74-13300 British Library Lending Div., Boston Spa (England).
PROFILES OF WIND VELOCITY AT THE ATMOSPHERIC BOUNDARY LAYER
N. L. Byzova 3 Sep. 1973 14 p refs Transl. into ENGLISH from Tr. Inst. Prikladnoi Geofiziki, Akad. Nauk SSSR (USSR), no. 20, 1965 p 35-43
(BLL-CE-Trans-6198-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The results of numerical calculations for wind velocity profiles are presented. These were carried out according to an arrangement for comparing the profiles measured. An assessment of the relationship between the geostrophic friction factor and stratification is given. Author

N74-13301 British Library Lending Div., Boston Spa (England).
COMPARISON OF EXPERIMENTAL AND ESTIMATED CLIMATOLOGICAL MAPS OF AVERAGE ANNUAL RADIATION BALANCE OF THE EARTH AND ITS COMPONENTS
K. Ya. Kondratev and L. N. Dyachenko Nov. 1973 7 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (USSR), v. 235, 1970 p 62-66
(BLL-RTS-8511) Avail: British Library Lending Div., Boston Spa, Engl.: £0.60; 2 BLL photocopy coupons

The results obtained in comparing estimated and experimental data on the global distribution of the average yearly radiation balance of the earth-atmosphere system and its components are discussed for increments of 10 degrees of latitude. The maps of the yearly albedo show that signficiant distribution of the albedo deviations from zones are observed in the equatorial zone. The greatest albedo value is found at high latitudes, and the smallest in the equatorial zone, over the ocean. It is concluded that the basic failing of estimated climatological maps for the radiation balance of the earth-atmosphere system is a systematic overstating of the albedo values, which leads to understated values of the radiation balance. F.O.S.

N74-13302 Arizona State Univ., Tempe.
AN APPROACH TO MODELING WEATHER DATA BY MEANS OF MARKOV AND SEMI-MARKOV CHAINS Ph.D. Thesis
Stephen Mead Lee 1973 244 p
Avail: Univ. Microfilms Order No. 73-20436

A general methodology for modeling weather data by means of Markov and Semi-Markov chains. It was first necessary to review and extend the theory of Markov and Semi-Markov chains and the pertinent statistical tests. These concepts and tests were incorporated into a step-by-step procedure which, when applied to a set of realizations of a meteorological time series, would result in the selection of an appropriate model. An attempt was made to explore methods of separating the systematic and random components in weather data. Several techniques were investigated. Of particular interest was that of applying the step-by-step procedure to the residuals, once the systematic component had been removed. The methodology was applied to seven different variables: rainfall, cloud cover, fog, ceiling and visibility, wind speed, temperature, and dew point. In the majority of cases a statisfactory model was determined. Dissert. Abstr.

N74-13303 Florida State Univ., Tallahassee.
SCALE INTERACTIONS OF FORCED QUASI-STATIONARY PLANETARY WAVES AT LOW LATITUDES Ph.D. Thesis
Douglas Arnold Abbott 1973 170 p
Avail: Univ. Microfilms Order No. 73-21344

A numerical model was designed to study the general circulation of the tropical and subtropical summer atmosphere. The initial data consisted of planetary-scale standing waves (zonal wave numbers 0-3) taken from time-averaged July data. The energy of the standing waves was maintained by time-independent, space-dependent diabatic heating. The initial data were integrated from zero to thirty days on a coarse mesh finite difference grid (5 by 5 deg) and the integrations were then repeated for days twenty-six through thirty on a half-mesh grid. It is shown that zonal asymmetries in diabatic heating directly or indirectly provide an important energy source for all of the climatological features. The heating creates planetaryscale available potential energy. Most of this potential energy is directly converted into planetary-scale kinetic energy. Dissert. Abstr.

N74-13304 Pennsylvania State Univ., University Park.
SATELLITE RADIANCE GRADIENTS AND CLEAR AIR TURBULENCE Ph.D. Thesis
James Augustine Woods 1972 86 p
Avail: Univ. Microfilms Order No. 73-20142

Radiance gradients obtained from the satellite infrared spectrometer (SIRS) on the Nimbus 3 and 4 spacecraft over the United States and the Atlantic Ocean, respectively, are related to the probability of clear air turbulence (CAT). It was shown that the radiance gradients measured by channel 4 of the SIRS represent the difference between two weighted mean winds, one centered at about 12 km, the other at about 6 km. It was also shown that the probability of encountering CAT is greatest when the horizontal radiance gradient is large. Making use of satellite data only, it is possible to avoid CAT almost entirely by avoiding areas of large radiance gradient. Radiance data collected by channel 3 of the SIRS originate from lower levels of the atmosphere. These can be used to remove the effects of low level horizontal temperature gradients on the channel 4 radiance gradients. It was found that the satellite data are better predictors of CAT over plains than over mountainous terrain.
Dissert. Abstr.

N74-13305 Oregon State Univ., Corvallis.
INVESTIGATION OF THE EFFECTS OF ATMOSPHERIC PRESSURE AND COMPOSITION ON Q-SWITCHED LASER PLUMES FROM METAL AND GRAPHITE TARGETS BY SPATIOTEMPORALLY RESOLVED EMISSION AND ATOMIC ABSORPTION MEASUREMENTS Ph.D. Thesis
Donald Edward Osten 1972 159 p
Avail: Univ. Microfilms Order No. 73-21318

Effects of atmospheric pressure and composition on the Q-switched laser plume from solid targets are investigated for analytical importance. Crater diameters, amounts of material vaporized, and velocities of materials leaving the sample surface are measured and simple calculations based on reversible thermodynamics are carried out, resulting in calculated values identical to measured values within experimental error. The concept of a breakdown threshold of the atmosphere for laser pulses is used in calculations, with the breakdown threshold for air above a solid sample estimated to be a factor of 18 less than the breakdown threshold for air alone. The difference between breakdown thresholds is suspected to be due to emission of electrons and ions from the sample at the focal point of the laser beam causing early breakdown of the atmosphere.
Dissert. Abstr.

N74-13306*# New York Univ., N.Y. Dept. of Meteorology and Oceanography.
INVESTIGATION OF MODELS FOR LARGE-SCALE METEOROLOGICAL PREDICTION EXPERIMENTS Final Report
Jerome Spar 31 Aug. 1973 31 p refs
(Grant NGR-33-016-174)
(NASA-CR-132883) Avail: NTIS HC $3.75 CSCL 04B

Studies are reported of the long term responses of the model atmosphere to anomalies in snow cover and sea surface temperature. An abstract of a previously issued report on the computed response to surface anomalies in a global atmospheric model is presented, and the experiments on the effects of transient sea surface temperature on the Mintz-Arakawa atmospheric model are reported. F.O.S.

N74-13307# Joint Publications Research Service, Arlington, Va.

METEOROLOGICAL MEASUREMENTS WITH SATELLITES
14 Nov. 1973 29 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno-Issled. Tsentr. SSSR (Leningrad), no. 104, 1972 22 p
(JPRS-60531) Avail: NTIS HC $3.50

Articles are presented on the determination of velocity fields by meteorological satellite measurements, estimating water content of clouds from meteorological data, and using satellite data on cloudiness and temperature to solve the problem of the orgin of fields of meteorological factors. For individual titles, see N74-13308 through N74-13310.

N74-13308 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE VELOCITY FIELD BY METEOROLOGICAL SATELLITE MEASUREMENTS
Sh. A. Musayelyan *In its* Meteorol. Meas. with Satellites (JPRS-60531) 14 Nov. 1973 p 1-10 refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno-Issled. Tsentr. SSSR (Leningrad), no. 104, 1972 p 3-10 (For availability see N74-13307 04-20)

The development of methods of reconstructing wind fields from cloudness data obtained by meteorological satellites above weakly illuminated regions is discussed. E.H.W.

N74-13309 Joint Publications Research Service, Arlington, Va.
ESTIMATING THE WATER CONTENT OF CLOUDS FROM METEOROLOGICAL DATA
N. A. Chuzavkova *In its* Meteorol. Meas. with Satellites (JPRS-60531) 14 Nov. 1973 p 11-19 refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno-Issled. Tsentr. SSSR (Leningrad), no. 104, 1972 p 65-72 (For availability see N74-13307 04-20)

Water resources of cloud fields over the territory of the Soviet Union were approximated using nephanalytical maps. Map data cover the degree to which the sky was covered with clouds, forms of cloudiness, and the position of cloud formations during specific periods. Mean seasonal values of water resources of different clouds of varying form were also discussed. Author

N74-13310 Joint Publications Research Service, Arlington, Va.
USE OF DATA ON CLOUDINESS AND TEMPERATURE IN SOLVING THE PROBLEM OF THE ORIGIN OF FIELDS OF METEOROLOGICAL FACTORS FROM SATELLITE DATA
Sh. A. Musayelyan *In its* Meteorol. Meas. with Satellites (JPRS-60531) 14 Nov. 1973 p 20-26 refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchno-Issled. Tsentr. SSSR (Leningrad), no. 104, 1972 p 20-26 (For availability see N74-13307 04-20)

Two theories relative to determining the geopotential field from satellite data on cloudiness, vertical velocities, and temperature are described. E.H.W.

N74-13311# Kanner (Leo) Associates, Redwood City, Calif.
RESULTS OF MEASUREMENTS BY NATIONAL AIR POLLUTION SAMPLING NETWORK (NASN) FISCAL YEAR 1970
1973 262 p Transl. into ENGLISH of "Showa 45-nendo Kokusetsu Taiki Osen Sokuteimo (NASN) sokuteikekka", Environ. Agency, Tokyo Bur. of Air Quality, Air Regulation Div., report, Jan 1972 Sponsored by EPA
(APTIC-43316; TR-295-73) Avail: NTIS HC $15.25

Air pollution data are presented which were obtained at 15 stations located throughout Japan. In these stations, measurements are taken all year round, using automatic measuring equipment, under the administration of the local governments. The stations measure the atmospheric components capable of automatic measurement which include: sulfur oxides, floating dust, nitrogen oxides, oxidants, and hydrocarbons. In addition, at a definite day of the month, the floating dust is sampled, and observations are made concerning the various components contained in the dust. D.L.G.

N74-13312*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUMMARY OF ATMOSPHERIC DATA OBSERVATIONS FOR 155 FLIGHT OF MSFC/ABMA RELATED AEROSPACE VEHICLES
D. L. Johnson 5 Dec. 1973 20 p refs
(NASA-TM-X-64796) Avail: NTIS HC $3.00 CSCL 04B

A summary of selected atmospheric conditions observed near launch time for 155 NASA-Marshall Space Flight Center and Army Ballistic Missile Agency related vehicles, launched primarily from Cape Kennedy, Florida, between August 20, 1953, and November 16, 1963, is presented. Values of ambient pressure, temperature, relative humidity, ground winds, visual observations, density aloft, and wind/wind shear aloft are included. The extremes of these parameters are listed for each type of launch vehicle. Author

N74-13313# Translation Consultants, Ltd., Arlington, Va.
DOUBTS CONCERNING THE SO-CALLED NEW-TYPE PHOTOCHEMICAL SMOG
Takaaki Kita 1973 26 p refs Transl. into ENGLISH from the publ. "Proceedings of the International Symposium on Air Pollution, Tokyo, 17-19 October 1972" 1972 p 427-440 Sponsored by EPA
(APTIC-47244; TR-607-73) Avail: NTIS HC $3.25

Air pollution meteorology is discussed in terms of unstable, stable, and neutral adiabatic lapse rates. The effects of humidity and stagnation, smoke, and air turbulence are also discussed. Serious incidents are analyzed of photochemical smog which resulted in hospitalization of individuals. F.O.S.

N74-13314# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES ON ESTABLISHING COMPUTER CONTROL METHODS FOR PREVENTION OF AIR POLLUTION
Feb. 1973 133 p refs Transl. into ENGLISH of Osaka Environ. Pollution Control Center, Japan, report, Mar. 1970 116 p Sponsored by EPA
(APTIC-30663; TR-347-73) Avail: NTIS HC $8.75

Air pollution control plans for various urban and regional areas were studied. Equations for calculating pollution concentration, and sources of air pollutants are discussed along with meteorological analysis for air pollution control, and atmospheric models. Methods for forecasting pollution concentration are presented. F.O.S.

N74-13315# Translation Consultants, Ltd., Arlington, Va.
CURRENT PROBLEMS OF PHOTOCHEMICAL SMOG IN JAPAN
S. Suzuki [1973] 51 p refs Transl. into ENGLISH from the publ. "Proceedings of the International Symposium on Air Pollution, 17-19 October 1972" 1972 p 377-418 Sponsored by EPA
(TR-608-73; APTIC-47246) Avail: NTIS HC $4.75

The problem of photochemical smog in Japan is reviewed in terms of: (1) the first reported occurrence and the subsequent frequency of reoccurrences, (2) countermeasures by the national and regional public bodies, (3) establishment of monitoring systems throughout the country, and (4) current status of photochemical pollution. In addition, the results are presented of surveys and studies of the problem. These results include data that correlate the incidence and intensity of the smog with meteorological parameters, season of the year, area of the country, and other pertinent factors. D.L.G.

N74-13316# Translation Consultants, Ltd., Arlington, Va.
GLOBAL AIR POLLUTION
[1973] 3 p refs Transl. into ENGLISH from Umschau (West Germany), no. 14, 1972 p 471-472 Sponsored by EPA
(TR-164A-73) Avail: NTIS HC $3.00

Climatological changes due to air pollution are discussed along with WMO guidelines for locating survey stations for measuring the global trends in air pollution. F.O.S.

N74-13317# Scientific Translation Service, Santa Barbara, Calif.
EPIDEMIOLOGY OF AIR POLLUTION
E. Grandjean [1973] 22 p refs Transl. into ENGLISH from Schweiz. Med. Wochschr. (Basel), v. 102, no. 52, 30 Dec. 1972 p 1889-1897 Sponsored by EPA
(TR-667-73; APTIC-49507) Avail: NTIS HC $3.25

Present knowledge of the effect of air pollution on the exposed population is reviewed. Day-to-day analyses have shown that mortality runs parallel to the level of air pollution. Respiratory, heart, and circulatory disease are the commonest causes of excess mortality. Two major studies in the U.S.A. have shown that

populations in areas of high pollution suffer a general increase in mortality due to respiratory disease. The relationships are independent of socioeconomic status. In these particular studies, the highest correlations were between sulfur dioxide and suspended particle content of the air. Further studies suggest that the nitrogen dioxide content of the air is also related to increased incidence of bronchitis. Carbon monoxide, which is believed to influence the nervous system at concentrations of 50 ppm, is also believed to exert a possible influence on the course of coronary disease. Author

N74-13318# Kanner (Leo) Associates, Redwood City, Calif.
AIR POLLUTION FROM AIRPORTS
H. A. Meester-Broertjes Jul. 1973 30 p Transl. into ENGLISH from Procestechniek (Netherlands), v. 27, no. 21, 10 Oct. 1972 p 683-693 Sponsored by EPA
(TR-595-73; APTIC-47405) Avail: NTIS HC $3.50

Air pollution by aircraft engine emission at Schiphol Airport was studied. The composition and concentration of the exhaust fumes are reported. It was found that the highest concentration of carbon monoxide, hydrocarbons, and aldehydes appear during the stationary phase, while nitrogen oxides, soot, and sulfur dioxide appear during the start. The air pollution at Schiphol due to air traffic amounts to 6700 tons per year. F.O.S.

N74-13319# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT RESULTS FOR HARMFUL GASES (H2S, HCl, AND SO2) IN THE ATMOSPHERE
Matsuoka Cho, Kitamura Toshio, Tahara Isao, Kondo Heiichiro, Bando Shigeyuki, Kondo Mitsugu, and Takeda Kimio Feb. 1973 13 p refs Transl. into ENGLISH of Tokushima Prefecture Public Health Lab., Japan, report, Feb. 1970 Sponsored by EPA
(TR-408-73; APTIC-26556) Avail: NTIS HC $3.00

The results are reported of surveys conducted in the Imakiri industrial area of Tikushima prefecture of Japan. The results include the following: (1) It was found that the hydrogen chloride concentration in the atmosphere was extremely low. A maximum concentration of 0.034 ppm was detected, followed by a value of 0.021 ppm, with all other values below 0.001 ppm. (2) The maximum concentration of hydrogen sulfide was 0.102 ppm, with all other values below 0.010 ppm. (3) The maximum concentration of the sulfurous acid gas was 0.090 ppm, but in most cases the values were below 0.010 ppm. D.L.G.

N74-13320# Kanner (Leo) Associates, Redwood City, Calif.
AIR POLLUTION BY HARMFUL GASES AND ITS COUNTERMEASURES
Noboru Yamate Feb. 1973 25 p refs Transl. into ENGLISH from Kuki Seijo (Japan), v. 3, no. 2, 1965 p 19-25 Sponsored by EPA
(TR-407-73; APTIC-07549) Avail: NTIS HC $3.25

Harmful gas pollutants were studied. The toxic gases emphasized include compounds of sulfur, nitrogen, oxygen, halogen, and organic. The sources of these contaminants are discussed. F.O.S.

N74-13321# Kanner (Leo) Associates, Redwood City, Calif.
AIR POLLUTION SITUATION AND METEOROLOGICAL ELEMENTS IN OSAKA, SECOND REPORT
Feb. 1973 112 p refs Transl. into ENGLISH of Osaka Environ. Pollution Control Center, Control Section, report Mar. 1970 Sponsored by EPA
(TR-348-73; APTIC-30170) Avail: NTIS HC $7.75

The procedures and network for monitoring air pollution in the Osaka prefecture are reported. The topography of the Osaka Plain is described along with the observation stations. Meteorological influences on air pollution are discussed, and the weather situation for days with very high pollution are presented. F.O.S.

N74-13322# Aeronautical Research Labs., Melbourne (Australia).
ON THE DURATIONS OF GUSTS AND LULLS IN THE WIND SPEED
D. J. Sherman and M. R. Thomson Apr. 1973 27 p refs
(ARL/SM-Note-391) Avail: NTIS HC $3.50

Experimental data, suggested scaling laws, and predicted theoretical curves are presented which enable the calculation of the probability of encountering a gust with a duration greater than any given duration, in given wind conditions. A numerical example is presented. Author

N74-13323# Finnish Meteorological Inst., Helsinki.
SELECTED CASE STUDIES OF THE SMALL SCALE STRUCTURE OF SYNOPTIC WEATHER DISTURBANCES
J. Riissanen 1973 33 p refs
(Contrib-78; ISBN-951-697-011-7) Avail: NTIS HC $3.75

A network of observation stations in the form of a triangle with sides of 25, 22 and 25 km was set up north-northwest from Helsinki in the summer of 1969. The station density in this network was between that of the beta and gamma networks defined by Fujita. Weather parameters were recorded in this network with conventional recording instruments, which are used at normal synoptic stations. With the recordings collected by the network, two frontal passages and two situations with shower activity were investigated. From the recordings, pressure fluctuations of three different types and of amplitudes of 0-2 mb were observed. Their movement through the network area and their connection with the rain intensity distribution were determined. The correlation between pressure and temperature was also determined during frontal passages. It was found to change with the time of the day. Author

N74-13324# Finnish Meteorological Inst., Helsinki.
ON THE SMALL SCALE STRUCTURE OF THE FIELDS OF TEMPERATURE, PRESSURE, HUMIDITY AND RAIN NEAR THE EARTH'S SURFACE
J. Riissanen 1973 26 p refs
(Contrib-79; ISBN-951-697-014-1) Avail: NTIS HC $3.50

The statistical structure described by the autocovariance function of pressure, temperature, relative humidity and rain was determined from the observations made at a special surface observation network, near Helsinki in the summer of 1969. The mean distance between the neighboring observation stations in the network consisting of 25 stations was 5.4 km. The random observational errors (observation errors including micrometeorological fluctuations) were estimated to be 0.4...0.5 mb for the pressure, 0.2...0.6 C for the temperature and 3.6...6.2% for the humidity. In the case of rain, these errors were determined to be 1.3 mm for the rain amounts collected during individual rain occasions, 1.9 mm, 2.5 mm and 3.0 mm for the rain amounts collected over 1, 2 and 3 days. According to the material available the station density in the network was observed to be statistically too high for all the parameters except perhaps for the short period rain. As a criterion for the required station density the errors of the linear interpolation between the stations were compared with the random observational errors. Author

N74-13325*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DISTRIBUTIONS OF EIGHT METEOROLOGICAL VARIABLES AT CAPE KENNEDY, FLORIDA AND VANDENBERG AIR FORCE BASE, CALIFORNIA
M. E. Graves (Northorp Services, Inc.), R. L. King (Northorp Services, Inc.), and S. Clark Brown 19 Nov. 1973 60 p refs Supersedes NASA-TM-X-53118
(NASA-TM-X-64795; NASA-TM-X-53118) Avail: NTIS HC $5.00 CSCL 04B

Extreme values, median values, and nine percentile values are tabulated for eight meteorological variables at Cape Kennedy, Florida and at Vandenberg Air Force Base, California. The variables are temperature, relative humidity, station pressure, water vapor pressure, water vapor mixing ratio, density, and enthalpy. For each month eight hours are tabulated, namely, 0100, 0400, 0700, 1000, 1300, 1600, 1900, and 2200 local time. These statistics are intended for general use for the space shuttle design trade-off analysis and are not to be used for specific design values. Author

N74-13326# World Meteorological Organization, Geneva (Switzerland).
DISTRIBUTION OF PRECIPITATION IN MOUNTAINOUS AREAS. VOLUME 1: PROCEEDINGS AND KEY-PAPERS PRESENTED DURING THE SESSION
1973 228 p refs Partly in ENGLISH and partly in FRENCH Proc. of the Symp. at Geilo, Norway, 31 Jul. - 5 Aug. 1972

2 Vol.
(WMO-326-vol-1) Avail: NTIS HC $13.50; WMO, Geneva

Proceedings and keypapers presented at the Geilo Conference, Norway, 31 July - 5 August 1972 are reported. They include instruments and measuring techniques, orographic influences on distribution of precipitation, precipitation network design in mountainous areas, methods of computation of area precipitation, and discussions and recommendations.
For individual titles, see N74-13327 through N74-13338.

N74-13327 National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
DISCUSSION OF PROBLEMS IN MEASURING PRECIPITATION IN MOUNTAINOUS AREAS
Eugene L. Peck *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 5-25 refs (For availability see N74-13326 04-20)

Precipitation measurement deficiencies, which are a function of many variables, exist in nearly all precipitation measurements. Much effort and research has been devoted to the problem of minimizing these measurement errors. Papers which deal with the general problem of improving precipitation measurements are reviewed. Specific areas of concern that are considered include evaporation losses in seasonal storage gages, wind effects on gage catch, horizontal versus sloping orifices, and precipitation measurements by radar. Author (ESRO)

N74-13328 Norwegian Meteorological Inst., Blindern.
OROGRAPHIC PRECIPITATION IN MOUNTAINOUS REGIONS
Jack Nordoe *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 31-62 refs (For availability see N74-13326 04-20)

A quantitative relation between precipitation and the large-scale wind component normal to large mountains is presented. A statistical approach is followed over a wide range of time periods and comments and comparisons with other papers presented are included. Author (ESRO)

N74-13329 Czechoslovak National Committee for the International Hydrological Decade, Bratislava.
OROGRAPHIC INFLUENCES ON DISTRIBUTION OF PRECIPITATION. PHYSIOGRAPHICAL FACTORS AND HYDROLOGICAL APPROACHES
Juraj Pacl *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 67-80 (For availability see N74-13326 04-20)

The general characteristics are described of orographic precipitation in mountainous areas with respect to the problems and difficulties of measurement and collection of data. Recommendations and limitations are outlined, based on experience gained in Czechoslovakia and with reference to reports of similar problems in other countries. Author (ESRO)

N74-13330 Atmospheric Environment Service, Downsview (Ontario).
PRECIPITATION NETWORK DESIGN FOR LARGE MOUNTAINOUS AREAS
Howard L. Ferguson *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 85-110 refs (For availability see N74-13326 04-20)

The problem of precipitation network design for mountainous areas larger than about 1000 sq km is examined. It is assumed that a principal objective of the network is to optimize the area precipitation distributions under the constraint of economic factors on the general network density and time-resolution. Network design is related to the problem of developing practical analytical models. The application of results from small intensively-instrumented research basins is discussed, along with the implications of rapidly expanding remote sensing technology. Principal recommendations concern integration of meteorological and hydrological network planning and analyses, increased emphasis on the use of physiographic models, consistent application of benefit-cost analyses and the development of a classification system for representative basins to facilitate transposition of research results. Author (ESRO)

N74-13331 Main Geophysical Observatory, Leningrad (USSR).
ESTIMATION OF AREAL PRECIPITATION
N. P. Rusin *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 115-136 refs (For availability see N74-13326 04-20)

Areal precipitation including mountain regions is estimated. A brief analysis of this problem is given, taking into account the papers presented at the symposium and the discussion.
Author (ESRO)

N74-13332 Agricultural Research Service, Boise (Idaho). Soil and Water Conservation Research Div.
COMPUTING ACTUAL PRECIPITATION
W. Russell Hamon *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 159-174 refs (For availability see N74-13326 04-20)

An analytical model for computing actual precipitation from unshielded and shielded gage data, independent of windspeed and type of precipitation, was derived by use of exponential wind functions to relate the ratios of catch by unshielded and shielded gages to actual precipitation. The single calibration coefficient in the model was experimentally verified in the field. The ratios of unshielded and shielded gage catch to actual precipitation were evaluated, by use of computed actual precipitation obtained by applying the model, as a function of windspeed and temperature. Author (FSRO)

N74-13333 Inland Waters Directorate, Ottawa (Ontario).
SNOW DISTRIBUTION IN AN ALPINE WATERSHED OF THE ROCKY MOUNTAINS, CANADA
Harry S. Loijens *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 175-183 refs (For availability see N74-13326 04-20)

A stepwise linear regression analysis of 3 years (1970-1972) measurements of spring snow-water equivalent in the Mistaya Basin covering a range of elevation from 1500 - 2800 m indicated that between 81 - 87% of the variance in the snow-water equivalent was associated with the physiographic variables elevation and slope. Azimuth and forest stand density were found to be insignificant at the 95% probability level. The snow accumulation pattern over the 3 years studied was consistent, although the regression coefficients varied from year to year with increasing total winter accumulation. The results indicate that one snow course is adequate to define the annual accumulation pattern. The derived regression equations are used in combination with a square-grid system to provide aereal distribution of snow-water equivalent in the basin.
Author (ESRO)

N74-13334 Uppsala Univ. (Sweden). Div. of Hydrology.
THE PROBLEM OF VERTICAL DISTRIBUTION OF PRECIPITATION, ESPECIALLY IN AREAS WITH GREAT HEIGHT DIFFERENCES. ADDITIONAL ANALYSIS AND RESULTS
Bengt Erik Ryden *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 184-187 (For availability see N74-13326 04-20)

The relationship between rainfall amount and altitude in an area where the lifting is a result of very steep mountains was studied. The runoff characteristics were examined using two precipitation series. One series has been running more than 50 years at a station near the basin outlet, and the other series consists of some periods of precipitation measurements made at two levels within the drainage basin of the river Kamajokk.
ESRO

N74-13335 Hydrological Research Inst., Pretoria (South Africa).
THE VARIATION OF MEAN ANNUAL RAINFALL WITH ALTITUDE AND LOCALITY IN SOUTH AFRICA, AS DETERMINED BY MULTIPLE CURVILINEAR REGRESSION ANALYSIS
Joan S. Whitmore *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 188-200 ref (For availability see N74-13326 04-20)

A semi-graphical method of multiple curvilinear regression analysis was used to derive the relationship between mean annual rainfall and altitude, and to determine modifications caused by factors such as aspect, continentality, and topographic trend. It

is concluded that the method has proved of great value in identifying the role and relative importance of the various environmental factors which combine and interact to produce a complex pattern of climate in South Africa. ESRO

N74-13336 Hydrometeorological Service, Tirana (Albania).
ATMOSPHERIC PRECIPITATION DISTRIBUTION IN ALBANIA [LA REPARTITION DES PRECIPITATIONS ATMOSPHERIQUES EN ALBANIE]
Raqi Mukeli *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 201-213 refs In FRENCH; ENGLISH summary (For availability see N74-13326 04-20)

Albania is mainly a mountainous country and it is located in the mediterranean zone. The distribution of the annual precipitations show the characteristics of the mediterranean climate. The quantity and the distribution of the precipitations are conditioned by the geographical location and by the orography of the country. Based on the existing data reduced for a period of 35 years and applying the theory of correlation for a number of variables the equation for the accounting of the precipitation was found exact for every locality of the territory in relation to the geographic parameters of height and distance from the sea. The effective precipitation are compared with those obtained by computation. Author (ESRO)

N74-13337 Colorado State Univ., Fort Collins.
THE RELATION OF RAINFALL NETWORK DENSITY TO ACCURACY OF RUNOFF PREDICTION IN A MOUNTAINOUS BASIN
Sven Jacobi and David R. Dawdy (Geol. Survey, Fort Collins, Colo.) *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 214-218 ref (For availability see N74-13326 04-20)

Three recording rainfall gages in a 9.7-square-mile basin in Southern California were used with a deterministic rainfall-runoff model to simulate flood hydrographs and peaks. The gain in accuracy of simulation achieved by using increasing amounts of data is discussed in terms of data network requirements. A segmented basin model extracts no more information from the rainfall data used than does a Thiessen weighted input to a nonsegmented model. Author (ESRO)

N74-13338 Servicio Colombiano de Meteorologia e Hidrologia, Bogota.
SOME RAINFALL FEATURES IN MOUNTAINOUS AREAS OF COLOMBIA AND THEIR IMPACT ON NETWORK DESIGN
Helmut Lessmann and Silviu Stanescu *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 219-228 refs (For availability see N74-13326 04-20)

Based on studies realized in Colombia and adjacent areas it is shown in appropriate graphs that in the mountainous areas of Colombia (about 500.00 sq km) of tropical highland climate, rainfall varies in space and time in a very complex manner. The main practical consequences of this complex character can be found in the design of the pluviometric network that at present is under organization, as well as in the estimation of data of sites which do not have direct measurements. Concrete conclusions are obtained on the density of stations and minimum vertical distances which are appropriate for the basic pluviometric network in the Colombian mountainous zones. Author (ESRO)

N74-13339# World Meteorological Organization, Geneva (Switzerland).
DISTRIBUTION OF PRECIPITATION IN MOUNTAINOUS AREAS. VOLUME 2: TECHNICAL PAPERS
1972 593 p refs Partly in ENGLISH; partly in FRENCH Proc. of the Symp. at Geilo, Norway, 31 Jul. - 5 Aug. 1972 2 Vol.
(WMO-326-vol-2) Avail: NTIS HC $31.75; WMO, Geneva

Instruments and measuring techniques, orographic influences on precipitation distribution, precipitation network design in mountainous areas, and methods of computation of areal precipitation are presented. For individual titles, see N74-13340 through N74-13389.

N74-13340 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
A CONTRIBUTION TO THE PROBLEM OF PRECIPITATION MEASUREMENTS IN MOUNTAINOUS AREAS
Bozidar Kirigin *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 1-12 refs (For availability see N74-13339 04-20)

Special precipitation measurements were performed at the mountain meteorological station Zavizan (1594 m) using various rain gages, during a period of several years (1964-65,1970-71). The resulting decade and monthly precipitation amounts show definite differences due to strengthened wind effects as well as the increase of snow forms of precipitation, rime formations, and snow drifting. An analysis of measurement results by various types of rain gages suggests the use of a special rain gage with a 500 sq cm orifice, a Nipher shielding ring, or a standard rain gage of the Woelfe system with a 200 sq cm orifice. These instruments can measure 3 to 14% greater precipitation amounts all the year round. Since the precipitation part in snow form exceeds 50% at 900 m during the winter and the mean snow depth is greater than 40 cm, the use of a shielding ring strain gage above that altitude is recommended. ESRO

N74-13341 Wyoming Univ., Laramie. Wyoming Water Resources Research Inst.
WINTER PRECIPITATION GAGE CATCH IN WINDY MOUNTAINOUS AREAS
Paul A. Rechard *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 13-26 refs (For availability see N74-13339 04-20)

Research designed to improve the accuracy of snowfall catch by precipitation gages was reported. The possibility of shielding precipitation gages from adverse site wind effects by using artificial wind barriers such as snow fences was studied. While true catch is still an unknown quantity, it was shown that a gage without any shielding will probably catch one third of that caught by gages located in a well protected opening in a forest. A gage with an alter-type shield will catch about 2/3, while a gage shielded by the proposed design will catch about the equivalent of the standard, and the percentage of standard catch will not vary with wind speed. ESRO

N74-13342 Southampton Univ. (England).
THE EFFECT OF WIND ON THE RAINFALL CATCH
Michael J. Green (Water Res. Assoc.) and P. R. Helliwell *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 27-46 refs Sponsored by Nat. Environ. Res. Council (For availability see N74-13339 04-20)

Wind profiles and raindrop trajectories above the British Meteorological Office Mk 2 rain gage were measured in a wind tunnel. Drop trajectories were calculated using a mathematical model. The results obtained were compared to those measured under natural wind conditions in the field. It was concluded that the height of turbulence zone is between 25 and 38 mm at a position 12.5 mm downwind of the rear lip of the gage. The increase in area of a gage required to catch the same amount of rainfall as a gage without any local wind effects is over 60% for a 2.2 mm diameter drop in a 10 m/s wind field. Raindrops in natural field conditions do not fall at their terminal velocities in the lower layers of the atmosphere. ESRO

N74-13343 Meteorological Office (Gt. Brit.).
THE DEE WEATHER RADAR PROJECT
Terrence W. Harrold, Roy B. Bussell (Water Resources Board), and William A. Grinsted (Plessey Radar Ltd.) *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 47-61 refs (For availability see N74-13339 04-20)

A weather radar system designed to measure precipitation amounts over a mountainous area using a weather surveillance radar as principal instrument is described. The aim of the project is to measure areal precipitation in real time on a space and time scale appropriate to hydrological requirements for water management and river regulation. The characteristics of the radar and auxiliary equipment, particularly the area rain gage network, are described together with details of the operational procedures related to the mountainous nature of the area. ESRO

N74-13344 West Virginia Univ., Morgantown. Div. of Forestry.
AN OPTOGRAPHIC TECHNIQUE FOR EVALUATING THE

EXPOSURE OF PRECIPITATION GAGE SITES IN MOUNTAINOUS AREAS
Richard Lee *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 62-72 refs (For availability see N74-13339 04-20)

In order to analyze site geometry in terms of its effect on the aerodynamic processes that influence precipitation catch and to determine the influence of local exposure on the apparent distribution of precipitation in mountainous areas, a routine objective method was developed. This method employs a unique photographic device to obtain projections of site geometry from a paraboloidal mirror. The device is mounted on the orifice of a precipitation gage, and is levelled and oriented with respect to fixed compass points on the instrument. The photographs are accurate stereographic projections of the hemisphere above the site, and include the field of view to about 12 deg below the horizon. Vertical and horizontal angles used to describe site geometry are read directly from enlarged photographs, or from the projections of transparencies on an accessory grid system. The usefulness of the optographic method in relating the exposure of precipitation gage sites to precipitation measurement errors, and to the representativeness of watershed precipitation samples, is being tested in a network of about 100 stations in mountainous West Virginia. Author (ESRO)

N74-13345 Intermountain Forest and Range Experiment Station, Ogden, Utah.
IMPROVED INSTRUMENTATION FOR MEASURING MELTED PRECIPITATION ON WINDSWEPT TOPOGRAPHY
Harold F. Haupt *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 73-85 refs (For availability see N74-13339 04-20)

The winter performances of three instruments were compared in clearings and coniferous forests on the windward and leeside of a mountain ridge in the northwestern US. The instruments included: (1) a standard weighing gage with horizontal orifice and windshield; (2) a similar gage with modified (stereo) orifice and titled windshield parallel to the slope inclination; and (3) a dual-purpose net precipitation-snowmelt lysimeter. Mounted on towers in windswept openings, the standard gage horizontal shield and modified gage-tilted shield were less efficient than the ground-level lysimeter by 49 percent and 24 percent respectively. The lysimeter proved most superior in measuring total seasonal (melted) precipitation. Furthermore, in the windswept forest the lysimeter outperformed the standard and modified gages, but the latter were nearly alike in total catch. On the lee side, protected in part from the full blast of wind, the lysimeter was only 7 to 8 percent more efficient than the mounted gages.
Author (ESRO)

N74-13346 Eidgenossische Technische Hochschule, Zurich (Switzerland).
PRECIPITATION MEASUREMENTS BY MEANS OF STORAGE GAGES WITH STEREO AND HORIZONTAL ORIFICES IN THE BAYES DE MONTREUX WATERSHED
Boris Sevruk *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 86-95 refs (For availability see N74-13339 04-20)

On the steep, open slopes in the proximity of the ridge which was exposed to rain bearing westerly winds, the stereo orifices yielded precipitation figures about twice as high as collected by horizontal orifices. At half the height of the slope in the wooded zone and in sheltered locations the stereo orifices yielded only a small increase or none at all. The increase of precipitation with altitude was more clearly evidenced in the values of the instruments with orifice surfaces parallel to the slope than in those with horizontal orifices. The results obtained with measurements over a period of 19 years show that stereo orifices are better suited than horizontal orifices to meet the requirements of precipitation measurements on steep, open slopes exposed to rain bearing winds. Author (ESRO)

N74-13347 Eidgenossische Technische Hochschule, Zurich (Switzerland).
EVAPORATION LOSSES FROM STORAGE GAUGES
Boris Sevruk *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 96-102 refs (For availability see N74-13339 04-20)

Many meteorological services use a 2-3 mm oil layer for the prevention of evaporation, with resulting errors in precipitation measurements using storage gates. The difference in precipitation catch between standard gages and storage gages was investigated. Results show that an oil layer of 2-3 mm thickness cannot prevent evaporation from storage gages and, in summer, may be a further source of error in precipitation measurements with storage gates. An example is the test area near lake Geneva where over a period of ten years, using both conventional and a storage gage with a 2 mm oil layer thickness, about 6% less precipitation was recorded in summer by using the storage gage. ESRO

N74-13348 Hydrometeorological Scientific Research Center (USSR).
ANALYSIS OF SNOW COVER DISTRIBUTION FROM AEROPHOTOGRAPHY DATA OVER EXPERIMENTAL MOUNTAIN BASIN OF VARZOB RIVER
T. S. Abaljan *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 103-110 refs (For availability see N74-13339 04-20)

The main characteristics of the snow cover in the mountain basin of the Varzob river (Central Asia) in the height interval 1400-4000 m are reported. To obtain these characteristics, data were used of aerial snow surveys made several times during the year 1964-1967. Author (ESRO)

N74-13349 Hydrometeorological Scientific Research Center (USSR).
SNOW SURVEY AND METHODS FOR SNOW STORAGE ESTIMATION IN MOUNTAIN RIVER BASINS OF THE SOVIET UNION
V. D. Kamarov, A. A. Kharschan, and V. M. Muchin *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 111-116 refs (For availability see N74-13339 04-20)

Procedures of snow survey in the mountains of the U.S.S.R. are considered as well as the application of snow survey and precipitation data in forecasting the snowmelt runoff of mountain rivers. The computation methods used for the preparation of snowmelt runoff forecasts were discussed. ESRO

N74-13350 Servizio Meteorologico Italiano, Milano.
SIGNIFICATION OF THE DURATION OF SNOWFALL AT HIGH ALTITUDE [SIGNIFICATION DE LA DUREE DE LA PRECIPITATION NEIGEUSE A GRANDE ALTITUDE]
Virgilio Ermini *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 117-127 refs In FRENCH; ENGLISH summary (For availability see N74-13339 04-20)

Interest in the analysis of snowfall duration to obtain reliable values of snow precipitation, as well as its water equivalent, in mountains above a certain level was emphasized. Results from the Italian Alps weather station data records on the duration of snowfalls was reported. ESRO

N74-13351 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
A POSSIBILITY OF AIRFLOW: PRECIPITATION REGIME INVESTIGATIONS
Nadezda Sinik *In* WMO Distribution of Precipitation in Mountainous Areas, Vol 2 1972 p 128-139 refs (For availability see N74-13339 04-20)

Daily precipitation charts from Gorski Kotar and Lika, mountainous regions in the northwest part of Yugoslavia, were analyzed in correlation to the prevailing gradient flow on AT 1000 and AT 850 mb. The resemblance of charts in same directional cases led to the establishment of mean daily isohyets. Rainy days with a stationary gradient flow (wind) on AT 1000 mb could be added to the corresponding cases of same directional flow on AT 1000 and AT 850 mb. The resulting mean daily charts are useful in forecasting precipitation in these regions. ESRO

N74-13352 Oxford Univ. (England). Dept. of Agricultural Science.
CHARACTERISTICS OF PRECIPITATION IN THE SCOTTISH HIGHLANDS
Frank H. W. Green *In* WMO Distribution of Precipitation in

Mountainous Areas, Vol. 2 1972 p 140-146 refs (For availability see N74-13339 04-20)

Precipitation in the Scottish Highlands has highly individual characteristics resulting from the location of Scotland and its topography. For the same reasons, difficulties in accurate measurement are increased. Both the characteristics of the precipitation, and the difficulties are discussed. Author (ESRO)

N74-13353 Meteorologisches Observatorium, Hohenpeissenberg (West Germany).
RAINFALL AT THE HOHENPEISSENBERG AND THE WEATHER SITUATION
R. Aniol *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 147-155 refs (For availability see N74-13339 04-20)

Some results of a detailed study on weather situation and precipitation during summertime at the Hohenpeissenberg are reported. All single precipitations for the months of May to end of September or the period 1965-1970 were used. Three main weather types showing different aerological vertical profiles in the lower troposphere are selected. The total amount of rain, the duration, and the intensity of rain show significant differences for the main weather types; these differences are explained. ESRO

N74-13354 Oslo Univ. (Norway). Inst. for Geophysics.
COMPUTATION OF AIR FLOW OVER MOUNTAINS IN STATICALLY STABLE SITUATIONS
Arnt Eliassen *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 156-160 ref (For availability see N74-13339 04-20)

Meso-scale of flow patterns over mountains are determined by numerical integration, with special attention on the distribution of the ascending motions causing orographic clouds and precipitation. Author (ESRO)

N74-13355 Oslo Univ. (Norway). Inst. for Geophysics.
OROGRAPHIC INFLUENCES ON DISTRIBUTION OF PRECIPITATION
Kaare Pedersen *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 161-170 ref (For availability see N74-13339 04-20)

A terrain profile of Norway representative for a grid having a mesh size of 50 km was estimated as proper for the study of terrain induced vertical air displacements. The vertical displacements and the resulting condensation were computed for the 4-5 September 1968 period using a quasi-geostrophic set of equations. Author (ESRO)

N74-13356 Bergen Univ. (Norway). Inst. for Geophysics.
DISTRIBUTION OF PRECIPITATION IN THE SOGNEFJORD REGION
Endre Skaar *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 171-185 refs (For availability see N74-13339 04-20)

During 1963-66 an agroclimatic investigation was carried out in the Sognefjord region. Daily precipitation amount was measured at 145 stations in the period April to October and at 50 stations in winter. The coast districts are among the most precipitatous in Norway. Thus the average annual precipitation at Brekke is 3354 mm. The valleys at the head of the easternmost parts of the fiord get only about 1/9 of this amount. The three years concerned, 64-66, include one wet year, one dry year and a year with near average precipitation amount. The mapping of the precipitation distribution in this area is to some extent based on theoretic considerations because most of the stations were sited near the fiord. The distribution pattern is dependent on the general weather type, mainly the wind conditions. This is illustrated by selected short periods in situations of different weather types. Author (ESRO)

N74-13357 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
MAXIMUM DAILY PRECIPITATION IN GORSKI KOTAR AND LIKA (YUGOSLAVIA) IN RELATION TO THE OVERFLYING AIR-STREAM
Nada Plesko *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 186-197 refs (For availability see N74-13339 04-20)

The areal distribution of precipitation daily maximums in Gorski Kotar and Lika (Yugoslavia) who studied in relation to the prevailing airstreams in the atmospheric layer from the earth surface and up to a height of about 1500 m. The isohyetal charts of daily maximums were elaborated for each of eight main wind directions. Based on the theory of Jenkinson, the estimates of daily maximums were found for various return periods and for selected stations as well as their maximum expected value. Author (ESRO)

N74-13358 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
STATISTICAL CONSIDERATIONS ABOUT SNOW CONDITIONS IN THE AUSTRIAN ALPS
Konrad Cehak *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 198-203 (For availability see N74-13339 04-20)

Characteristics of statistical distributions of some precipitation parameters for describing the snow cover are calculated. The dependency of these characteristics on the place of the observing station with regard to the Alps and to altitude is investigated. The results are represented in a set of composite maps. Author (ESRO)

N74-13359 Hydrometeorological Scientific Research Center (USSR).
ABOUT VERTICAL GRADIENTS OF LIQUID PRECIPITATION IN MOUNTAINS
A. P. Zhidikov and A. G. Levin *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 204-211 ref (For availability see N74-13339 04-20)

In order to get a true vertical representation of precipitation in mountains, the combination vertical profiles of measured precipitation and wind in specified mountain areas are considered. Comparisons are made of actual vertical gradients of precipitation with gradients of measured precipitation affected by wind. Observational procedures are suggested to investigate vertical distribution of liquid precipitation as well as for mapping isohyets of liquid precipitation in mountainous areas. Author (ESRO)

N74-13360 State Hydrological Inst. (USSR).
METHODS FOR THE STUDY OF LAWS FOR THE DISTRIBUTION OF PRECIPITATION IN MEDIUM-HIGH MOUNTAINS (ILLUSTRATED BY THE VITIM RIVER BASIN)
V. S. Vuglinski *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 212-221 refs (For availability see N74-13339 04-20)

Methods for the computation of mean annual and monthly precipitation for mountain basins are illustrated by the Vitim river basin in the Trans-Baikal area. On the basis of data from the standard meteorological network using relations between precipitation and the altitude of the region, long term mean annual and monthly precipitation for individual basins are computed. The areal distribution of precipitation is accounted for by local orography. Diagrams of the transformation of moisture fluxes over mountainous terrain presented. A possibility for the determination of mean long term annual precipitation for mountain basins, in the absence of observational data on runoff and radiation balance, is considered by using the equations of Schreiber, Oldekopp and Budyko. Author (ESRO)

N74-13361 Electricite de France, Paris. Div. Technique Generale.
PRECIPITATION EXTENSION OF LOMBARDE ON THE FRENCH ALPS [EXTENSION DES PRECIPITATIONS DE LOMBARDE SUR LES ALPES FRANCAISES]
R. Grard and P. Mathevet *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 222-233 In FRENCH; ENGLISH summary (For availability see N74-13339 04-20)

Heavy orographic rainfall associated with circulation from the southeast is mainly concentrated on the Italian side of the western Alps. It was shown that in such meteorological conditions a wind called Lombarde blows down the western slopes and intense precipitations cover defined areas of the high French valleys such as the upper Isere Valley, the left side of the Arc Valley above Modane, and Guil valley above Abries. It was also shown that in these areas the most intense daily rainfall in the year usually occurs under the Lombarde wind effect. ESRO

N74-13362 National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
PATTERNS TO METEOROLOGICAL PARAMETERS
Eugene L. Peck *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 234-242 refs (For availability see N74-13339 04-20)

To predict orographic precipitation variations in the western United States for improved short- and long-term airflow forecasts and precipitation analyses, multivariate correlation analyses were used. Twelve hour precipitation values for stations in the Wasatch Front ranges of northern Utah having a large range of elevation were correlated to meteorological parameters derived from radiosonde observations. The agreement of statistical procedures with earlier storm typing work indicating two general precipitation distribution patterns is most encouraging. It is shown that the analysis can be extended to predict precipitation distribution in mountainous areas for individual storms. The incorporation of these inferred distributions provides a better mean of seansonal and short term hydrological forecasting than can be obtained from point surface measurements alone. ESRO

N74-13363 Atmospheric Environment Service, Toronto (Ontario).
THE DISTRIBUTION OF PRECIPITATION IN SOME MOUNTAINOUS CANADIAN WATERSHEDS
Donald Storr and Howard L. Ferguson *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 243-263 refs (For availability see N74-13339 04-20)

Research investigations in western Canada on the distribution of precipitation in mountainous areas are described. They include IHD experimental basin projects located on the eastern slopes of the Rocky Mountains in Alberta. Records covering five to ten years are available for these basins and problems of gage exposure, network design and data collection and analysis are discussed in some detail. Two projects in British Columbia, one on Vancouver island and another in the Okanagan Basin in the interior, were established more recently and only preliminary results can be provided at this time. Author (ESRO)

N74-13364 National Weather Service, Silver Spring, Md. Water Management Information Div.
PHYSIOGRAPHICALLY ADJUSTED PRECIPITATION-FREQUENCY MAPS
John F. Miller IN WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 264-277 refs (For availability see N74-13339 04-20)

Investigations of the precipitation frequency in the western mountain country of the United States are reported. An attempt was made to depict the variations of the precipitation frequency regime with the variations in physiographic factors for return periods between 2 and 100 years and durations of 6 to 24 hours. Relationships between precipitation frequency data at stations and topographic and climatic parameters, such as elevation, exposure, and normal annual precipitation, were developed. In some portions of the mountainous western US, snow contributes significantly to the series of extreme precipitation amounts. In these regions, an additional set of maps were prepared which depict the precipitation frequency regime for the May to October season, when practically all heavy precipitation is in the form of rain. Author (ESRO)

N74-13365 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
THE CHARACTERISTIC CHANGES OF THE AMOUNT OF PRECIPITATION IN CONNEXION WITH ALTITUDE IN THE MOUNTAINOUS AREAS OF YUGOSLAVIA
Igor Delijanic *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 278-289 (For availability see N74-13339 04-20)

A method for chartographic analysis of precipitation for a climatic atlas of Yugoslavia was reported. The method, determining changes of precipitation with altitude by graphical correlation, was analyzed with interesting results concerning variations of precipitation amounts with altitude during the winter half of the year. The influence of orography and some other main parameters on the distribution on precipitation along some characteristic profiles in Yugoslavia was analyzed. ESRO

N74-13366 Pakistan Meteorological Dept., Karachi.
DISTRIBUTION OF PRECIPITATION IN MOUNTAINOUS
Florence C. Khurshid Alam *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 290-306 refs (For availability see N74-13339 04-20)

Work on the preparation of monthly, seasonal and annual normal storm isohyetal maps of West Pakistan to forecast floods of the Indus Basin main rivers is reported. The report includes data on orographic influences on the distribution of precipitation distribution of rainfall stations in mountainous areas with adequate equipment, such as rain/snow gages and methods of aerial precipitation computation. The techniques of evolving topographically adjusted precipitation in other areas of West Pakistan were reviewed. ESRO

N74-13367 World Meteorological Organization, Geneva (Switzerland).
PRECIPITATION IN TAIWAN MOUNTAINOUS AREAS
Paul S. Pan *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 307-321 refs (For availability see N74-13339 04-20)

The weather elements of Taiwan Island, located astride the Tropic of Cancer, in the midst of the east Asian monsoon system, and a target of typhoons, were described. Problems, both in measurement and calculation of mountain precipitation by orographic effects, were discussed. Because of its distance from the Southern Hemisphere source regions, the summer southwest winds approaching Taiwan are weaker and less regular than their winter northeast counterparts. The island receives very little snowfall even on mountain peaks exceeding 3,000 meters in height; the annual island precipitation, attributable mainly to monsoons and typhoons, averages 2340 mm (92 inches). Due to rugged topography and the NE 25 oriented Central Mountain Range, the orographic effect has a great influence on the distribution in mountain areas of precipitation caused by monsoons, and additional precipitation caused by tertiary circulations. Author (ESRO)

N74-13368 Meteorological Office (Gt. Brit.).
OROGRAPHIC INFLUENCES ON THE DISTRIBUTION OF PRECIPITATION
A. Bleasdale and Y. K. Chan (Birmingham Univ.) *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 322-333 refs (For availability see N74-13339 04-20)

Using a computer and data for several thousand stations, an attempt was made to investigate the influence of orography on the spatial distribution of average annual rainfall over the UK. It is shown that combining this type of study with automated cartography and the use of 5 km rainfall grid might provide important advances in UK hydrometeorological work.
Author (ESRO)

N74-13369 National Weather Service, Silver Spring, Md. Office of Hydrology.
EXTREME THUNDERSTORM RAINFALL IN THE INTER-MOUNTAIN WESTERN UNITED STATES
John T. Riedel and E. Marshall Hansen *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 334-345 refs (For availability see N74-13339 04-20)

Studies show the intense local thunderstorm is the most critical rain producer for small drainages in the large intermountain region, bordered by the Continental Divide on the east and the Sierra Nevada with their extension, the Cascades, into Canada on the west. Data from such storms, producing rainfalls of 100 to 290 mm in an hour or so, were analyzed. The development of a generalized chart of probable maximum thunderstorm rainfall was described. Estimates for 1 hour over 2 sq km range from 170 to 300 mm within the region. The derived 1-hour rainfall depth-area relation, based on limited data, gives 20 percent of the 2 sq km value for a 1000 2 km area. Studies to find preferred localities (with respect to terrain features) for most extreme occurrences are described. Some data suggest a decrease in shortduration rains for elevations above 1500 m. Ultimately, for higher elevations, distant from lower valleys, thunderstorm rainfall must begin to decrease. A decrease of 5 percent per 300 m for elevations above 1500 m was adopted for probable maximum thunderstorm rainfall. Author (ESRO)

N74-13370 Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
WATER YIELD AS AN INDEX OF LEE AND WINDWARD TOPOGRAPHIC EFFECTS ON PRECIPITATION
Henry W. Anderson *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 346-358 refs (For availability see N74-13339 04-20)

In mountainous areas, the best precipitation maps are derived by distributing streamflow back on the watershed and correcting for evapotranspiration. Special problems arise in the lee of major mountain barriers, such as the Sierra Nevada of California. There, the relation of mean annual streamflow to topography was determined from data for 14 watersheds. Variables indexing effects of rise, air flow separation, spillover, and barrier height explained 99 percent of the variance; standard error was 11 percent. Rise and flow separation were important. Streamflow increased for the area 8 km to the lee of the Sierra Nevada ridge, and decreased progressively with elevation above and below about 2700 m. Evapotranspiration estimates were obtained from snow course accumulations during periods with snow only and from the streamflow relations to topography. Author (ESRO)

N74-13371 World Meteorological Organization, Geneva (Switzerland).
INFLUENCE OF OROGRAPHY ON THE SHARE OF PRECIPITATION IN THE EAST ALPINE HIGH MOUNTAINS
H. Tollner *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 359-361 refs (For availability see N74-13339 04-20)

The influence of orography on seasonal distribution of precipitation in the eastern Alps was analyzed. Minimum and maximum precipitation shifts were noted, particularly the maximum shift from July in the valleys to June. Author (ESRO)

N74-13372 Uppsala Univ. (Sweden). Div. of Hydrology.
ON THE PROBLEM OF VERTICAL DISTRIBUTION OF PRECIPITATION, ESPECIALLY IN AREAS WITH GREAT HEIGHT DIFFERENCES
Bengt Erik Ryden *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 362-372 refs (For availability see N74-13339 04-20)

Results of precipitation measured by totalizers during the summers 1967 to 1971, in the high mountains of northern Sweden are reported. The precipitation data were correlated to an analysis of air masses and wind directions. The sites of the instruments covered a vertical distribution of more than 1500 m in the drainage basin of the Kamajok (part of the high mountains of northern Scandinavia). Results show a near linear increase of precipitation with altitude. During season with a higher amount of precipitation, the increase with altitude is greater. ESRO

N74-13373 Office de la Recherche Scientifique et Technique Outre-Mer, Yaounde (Cameroon).
ASPECTS OF THE RAINFALL IN THE REGION OF MT. CAMEROON [ASPECT DE LA PLUVIOMETRIE DANS LA REGION DUMONT CAMEROUN]
Robert Lefevre *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 373-382 refs In FRENCH; ENGLISH summary (For availability see N74-13339 04-20)

Mount Cameroon shows emphasized pluviometric singularities due to its compact mass and its geographic situation at the southern limit of the moving inter-tropical front: the annual average of rainfall is maximum at Debundscha where it reaches 390 inches average over 38 years, the maximum rainfall being 578 inches. The pluviometric obsverations made for several years allow an outline the annual isohyets in this region and reveal the influence of the mountain mass and the variability of annual rainfall. Author (ESRO)

N74-13374 Electricite de France, Paris.
USE OF GRADEX FOR THE EVALUATION OF RISKS FOR INTENSE PRECIPITATION OVER THE FRENCH ALPS REGION ACCORDING TO THE SEASON [EVALUATION DES RISQUES DE FORTES PRECIPITATIONS SUR LES REGIONS ALPINES FRANCAISES SELON LA SAISON. UTILISATION DU GRADEX]
D. Duban and R. Grard *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 383-395 refs In FRENCH; ENGLISH summary (For availability see N74-13339 04-20)

The method used for the statistical analysis of data on daily precipitation at a given place was outlined. Return periods of large precipitations are defined by a parameter called the Gradex (gradient of extreme values) which can be estimated with a good approximation from reliable observations of daily rainfall over a few years. The Gradex was applied to the analysis of data recorded at three regions of the French Alps for calculation of flood probability. The validity of the Gradex method is emphasized. ESRO

N74-13375 World Meteorological Organization, Geneva (Switzerland).
MEASUREMENT, VERIFICATION, AND DISTRIBUTION OF ATMOSPHERIC PRECIPITATION OVER MOUNTAINOUS REGIONS [MESURE, VERIFICATION ET REPARTITION DES PRECIPITATIONS ATMOSPHERIQUES DANS LES REGIONS DE MONTAGNES]
K. Chomicz *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 396-415 In FRENCH; ENGLISH summary (For availability see N74-13339 04-20)

In mountainous areas, there are many problems connected with the measurement and distribution of atmospheric precipitation. Wind speed effects result in great deficiency of precipitation on one side of a mountain, and in an excess on the other. Many examples of anomalies of precipitation, with illustrations of the land and anemometric conditions, were presented. Data from totalizers over a ten-year period recorded at different distances from the Atlantic Ocean were used. A method was proposed aimed at the verification of precipitation, thus providing the basic information to draw isohyets. ESRO

N74-13376 Arizona Univ., Tucson.
OPTIMUM DESIGN OF MOUNTAINOUS RAINGAGE NETWORKS USING BAYESIAN DECISION THEORY
Donald R. Davis, Chester C. Kisiel, and Lucien Duckstein *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 416-420 refs (For availability see N74-13339 04-20) (Grant Di-14-31-0001-3708)

The problem of spacing rain gages along the slope of a mountain is examined, and the modelling of aerial rainfall in mountainous watersheds is considered from the viewpoint of making design and operations decisions. As altitude increases, precipitation amount and the costs associated with raingages increase; on the other hand, the catchment area may decrease. These factors, along with a loss function supplied by the managerial problem, are incorporated into a Bayesian decision theory framework in order to study the following problems. The effect of uncertainty in the parameters of the rainfall model, due to limited data, on the raingage network design., and the value of adding or removing one gage from a set. This conceptual framework is illustrated with experimental data. Author (ESRO)

N74-13377 Central Water and Power Research Station, Poona (India).
STUDY OF OROGRAPHIC EFFECT ON OPTIMUM NUMBER OF RAINGAUGES
C. V. Cole, G. A. Kulkarni, and G. D. Khatavkar *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 421-431 (For availability see N74-13339 04-20)

A method for determining the optimum number of rain gages required to estimate catchment mean monthly or seasonal rainfall with the desired degree of accuracy and confidence level, based on a statistical approach, is described. Rainfall intensities recorded at existing raingage stations situated in the two hilly basins of Bhatgar and Konya were analyzed. Catchment Bhatghar has an east-west spread and a certain trend in rainfall while Koyna has a north-south spread and a good deal of variation but no trend in rainfall. Methods allocation of additional number of rain gages required for these two catchments are considered separately on the basis of their peculiar orographic characters.
Author (ESRO)

N74-13378 Agriculture Dept., Beltsville, Md. Hydrograph Lab.
SPECTRA OF PRECIPITATION SERIES IN MOUNTAINOUS REGIONS

D. M. Hershfield, G. H. Comer, and B. Levy *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 432-447 refs (For availability see N74-13339 04-20)

Spectral analysis was used to study the variation of rainfall at stations with different exposures. The time series consists of both daily data and short-duration increments from individual major storms from locations in Maryland, Idaho, Vermont, and Virginia. The statistics provide a measure of the persistence and uniformity of the precipitation between the gages and an indication of the spatial and temporal resolution required for the establishment of an adequate network. Author (ESRO)

N74-13379 Birmingham Univ. (England).
THE USE OF THE MODIFIED TIME SERIES ANALYSIS TECHNIQUE FOR THE DETERMINATION OF AREAL PRECIPITATION ACCURACIES
Peter Hutchinson *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 448-465 refs (For availability see N74-13339 04-20)

Futher work on a modified time series analysis technique for determining areal precipitation accuracies, using daily rainfall data from an area of accentuated relief is reported. The effect of changes in the lag intervals used in the determination of the standard error of the areal precipitation is studied, and simple rules for the selection of the optimum lag interval are presented. For given areas the raingage network density was varied, and the effect of this variation on the calculated accuracy of the areal precipitation is shown. Daily precipitations were grouped according to six prevailing synoptic situations, and it is shown that different accuracies of areal precipitation determinations can be expected. Author (ESRO)

N74-13380 Norwegian Water Resources and Electricity Board, Oslo.
DEFICIENCIES IN MEASURED SNOW PRECIPITATION IN A MOUNTAINOUS AREA IN NORWAY
Ola G. Gjorsvik *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 466-473 ref (For availability see N74-13339 04-20)

Deficiencies in measured precipitation were noticed during observations of runoff and precipitation in Groset Norwegian River Basin of 5.91 sq km area and a mean altitude 990 m. These deficiencies were due to observational difficulties as well as greater wind velocity in mountainous areas. A water balance for the period 1949-1968 was established, based on observations of precipitation (3 stations), runoff, groundwater stage and snow surveys. For winter seasons, the ratio between true precipitation and observed precipitation in Norwegian standard gages was estimated at 1.51. Author (ESRO)

N74-13381 Stanford Research Inst., Menlo Park, Calif.
PRECIPITATION ESTIMATES FROM METEOROLOGICAL SATELLITE DATA
P. A. Davis and Sidney M. Serebreny *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 474-483 (For availability see N74-13339 04-20)

Existing series of cloud photographs from polar-orbiting satellites were utilized in a technique designed to estimate total precipitation (rain and snow) over a mountainous drainage basin in northwestern Montana. Daily precipitation for the entire basin was defined from analyses of surface observations and climatological data within the basin. Satellite-viewed cloud cover was distinguished in terms of eight exclusive categories representative of differing probable contributions to basin precipitation. After a dominant categorization was assigned to each successive 12-hour period, estimates of the cumulative basin precipitation were obtained by summation of probable amounts assigned to each cloud category. Author (ESRO)

N74-13382 Swiss Forest Research Inst., Birmensdorf.
FACTORS AFFECTING THE ESTIMATE OF AREAL AVERAGE SUMMER AND WINTER PRECIPITATION IN A SMALL CATCHMENT OF THE SWISS PREALPS
Hans M. Keller *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 484-496 refs (For availability see N74-13339 04-20)

Four-year records were analyzed from 12 storage and four precipitation gages, as well as 17 snow courses in two catchments, Rothenbach and Schwaendlichbach, situated in the Prealps of western Switzerland, ranging from 1120 to 1640 m. The local variation in monthly catch of liquid precipitation is best explained by the topographic position of the gages considering prevailing wind conditions in the catchment. In winter, storage gages are of restricted use in estimating the distribution of winter precipitation. Snow course data indicate that snow distribution in winter may be estimated using wind speed and potential radiation as topographic parameters. A procedure for data adjustment to estimate areal average summer and winter precipitation in the catchment is given. Author (ESRO)

N74-13383 Meteorological Office (Gt. Brit.).
AREAL RAINFALL ANALYSIS BY COMPUTER
Pauline M. Salter *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 497-509 refs (For availability see N74-13339 04-20)

The CARP (Comprehensive Areal Rainfall Program) for the plotting and drawing of isohyetal charts is described. The method, adopted for use for any required area in the United Kingdom, is based on a 5 km grid. Rainfall values for the grid points are obtained by interpolation from the irregular station network; and allowance is made for the effects of topography by use of a background field of average annual rainfall. Having obtained grid-point values for this relatively dense and regular network, areal rainfalls over irregular areas may be calculated simply by averaging values within the area. It is concluded that CARP is feasible. Author (ESRO)

N74-13384 Technische Universitaet, Brunswick (West Germany). Leichtweiss-Inst. fuer Wasserbau.
COMPUTERIZED CALCULATION OF AREAL PRECIPITATION AND ITS ACCURACY
Heiko Vahl *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 510-524 refs (For availability see N74-13339 04-20)

The accuracy of the results gained from the computation of areal precipitation of annual and daily amounts of rainfall was compared with the traditionally applied method. The investigations were carries out using a watershed in northwestern Germany with an area of about 4.400 sq km and a maximum network density of rain gaging stations of about 2.0 stations/100 sq km. The procedures are briefly described, and the results obtained by a large statistical evaluation are also discussed.
Author (ESRO)

N74-13385 Forest Service, Logan, Utah. Forest Sciences Lab.
SOME INTRA-STORM CHARACTERISTICS OF HIGH-INTENSITY RAINFALL BURSTS
Eugene E. Farmer and Joel E. Fletcher *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 525-531 refs (For availability see N74-13339 04-20)

Basic data for analyses of high intensity rainfall bursts were obtained from two rainfall intensity gage networks located in central and north central Utah. Twenty-five intensity gage stations are located at altitudes between 1325 and 3095 m. Of these, eighteen gages are at altitudes greater than 2440 m. Analyses included: (1) intra-storm timing and number of bursts, (2) distribution of storm rainfall by 10 percent for of storm duration, and (3) relationship between depth of total storm rainfall and depth of burst rainfall. More than 50 percent of the total storm rainfall depth occurs in 25 percent of the storm period; usually more than half of the total depth of rain is delivered as burst rainfall. Rainfall bursts occur most frequently in the first quarter of the storm period. Design data is presented for storms which contain a burst of 10 minutes or longer with return periods of 2 and 10 years. Author (ESRO)

N74-13386 Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
A HYDROLOGICAL ASSESSMENT OF PRECIPITATION IN THE WESTERN HIGHLANDS OF NEW GUINEA
Elizabeth M. Shaw *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 532-543 refs (For availability see N74-13339 04-20)

Estimates of the frequency of high intensity falls and their areal distribution were required during a feasibility study for a land drainage scheme in an intermontane plateau in New Guinea

at an altitude of about 1500 m (5,000 ft) about sea level and with an average annual precipitation of 2600 mm (102 in). Using the available short-period autographic data and an eighteen-year daily record, depth-duration-frequency curves were established for rainfall at a point. The maximum daily fall recorded in the area is 102 mm (4 in). Some tentative explanations are given. The determination of areal rainfall from point measurements was approached in several ways and an average reduction factor of 75% was found for an area of about 420 sq km (162 sq mile) assuming a maximum point storm of 102 mm (4 in).
Author (ESRO)

N74-13387 Meteorologisches Observatorium, Hohenpeissenberg (West Germany).
AREA PRECIPITATION MEASUREMENT WITH X-BAND RADAR FROM A MOUNTAIN NORTH OF THE ALPS
Walter Attmannspacher *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 544-551 refs (For availability see N74-13339 04-20)

At the Hohenpeissenberg Observatory, precipitation was measured using an X-band radar between the surface level and the basis of the cloud layer. Results were compared using a rain gage network. Some results were discussed and showed that the method of measuring areal precipitation using X-band radar is useful, but the attenuation of the radar beam caused by precipitation is too high for the 3.2 cm wavelength. Use of C-band radar is recommended. (ESRO)

N74-13388 Utah State Univ., Logan. Utah Water Research Lab.
A HYBRID COMPUTER SIMULATION MODEL FOR PREDICTING THE EFFECTS OF THE AREAL DISTRIBUTION OF PRECIPITATION ON RUNOFF CHARACTERISTICS
Eugene K. Israelsen and J. Paul Riley *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 552-564 refs (For availability see N74-13339 04-20)

The distributed parameter hydrologic model based on fundamental relationships is described. Spatial resolution was achieved by subdividing the modeled area and by applying average values of model parameters within each subzone. Input data for each subzone consist of precipitation, temperature, and physical characteristics (slope, soil type, rooting depth, and vegetative cover). The snow accumulation and ablation processes were also considered. To demonstrate its ability to predict the effects of aerial distribution of precipitation on runoff characteristics, the model was applied to a watershed within the Wasatch Mountains of northern Utah. Telemetered precipitation stations were distributed throughout the area. The computer model predicts actual runoff patterns and simulates runoff patterns under assumed patterns of precipitation distribution. Author (ESRO)

N74-13389 Institute of Hydrology, Wallingford (England).
ESTIMATING AREAL RAINFALL BY FITTING SURFACES TO IRREGULARLY-SPACED DATA
K. A. Edwards *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 565-587 refs (For availability see N74-13339 04-20)

Polynomial surfaces (trend surfaces) are compared with double Fourier series surfaces in terms of their goodness of fit to the observed data, and the effects of including altitude as a further variable are examined. Methods of simplifying these techniques for practical use are discussed. Author (ESRO)

N74-13390# Technische Hochschule, Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
EVAPORATION AS A PROBLEM OF TURBULENT DIFFUSION IN THE ATMOSPHERE [DIE VERDUNSTUNG ALS PROBLEM DER TURBULENTEN DIFFUSION IN DER ATMOSPHERE]
Juergen Dammann 1972 309 p refs In GERMAN
(Rept-8) Avail: NTIS HC $17.50

For the evaporation process of surface water, mathematical models of turbulence and of diffusion were investigated. Two turbulence models are presented: one in which the turbulent flow consists of independent movements of different frequencies, and one based on wind profiles. In the diffusion model used, the turbulent flow with space variable diffusion coefficients not only depends on concentration gradients, but also on diffusion coefficient gradients. From meteorological measurements, two dimensional wind velocity probability densities and energy density spectra were derived. Theoretical and experimental calculations were compared. ESRO

N74-13391# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, May 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, MAI 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in May 1972 are presented. ESRO

N74-13392# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jun. 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JUIN 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in June 1972 are presented. ESRO

N74-13393# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jul. 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JUILLET 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in July 1972 are presented. ESRO

N74-13394# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Aug. 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, AOUT 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in August 1972 are presented. ESRO

N74-13395# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Sep. 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, SEPTEMBRE 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in September 1972 are presented. ESRO

N74-13396# Institut Royal Meteorologique de Belgique, Brusselsj
SYNOPTIC OBSERVATIONS Monthly Bulletin, Oct. 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, OCTOBRE 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in October 1972 are presented. ESRO

N74-13397# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Nov. 1972 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, NOVEMBRE 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in November 1972 are presented. ESRO

N74-13398# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTICS OBSERVATIONS Monthly Bulletin, Dec. 1972

[OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, DECEMBRE 1972]
1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in December 1972 are presented. ESRO

N74-13399# European Space Technology Center, Toulouse (France). Meteosat Project Office.
ESRO'S METEOSAT PROGRAMME
D. Lennertz 1973 8 p Presented at the Intern. Symp. on Meteorol. Satellites, Paris, 21-24 May 1973
Avail: NTIS HC $3.00

The objectives of the Meteosat program are to develop and implement a geostationary meteorological satellite and the associated ground facilities as a contribution to the Global Atmospheric Research Program, and subsequently to the World Weather Watch. The Meteosat program and mission objectives, the system configuration and design constraints, and the present status of the program are described. Author (ESRO)

N74-13400# European Space Technology Center, Toulouse (France). Meteosat Project Office.
THE EARTH SEGMENT OF METEOSAT SATELLITE [LE SEGMENT SOL DE METEOSAT]
C. Honvault 1973 23 p refs In FRENCH; ENGLISH summary Presented at the Intern. Symp. on Meteorol. Satellites, Paris, 21-24 May 1973
Avail: NTIS HC $3.25

Ground station facilities of the Meteosat satellite are discussed, satellite data reception; signal demodulation; radiometric data processing; meteorological data processing; satellite tracking; and emission of signals for tracking, dissemination, interrogation of platforms. Processing of radiometric data was emphasized high resolution images of earth both in infrared and in visible channels; meteorological information; and critical problems in the development of necessary hardware to perform these functions. ESRO

N74-13401# European Space Technology Center, Toulouse (France). Meteosat Project Office.
THE METEOSAT DATA COLLECTION MISSION [LA MISSION COLLECTE DE DONNEES DE METEOSAT]
C. Honvault 1973 15 p refs Partly in FRENCH and partly in ENGLISH; ENGLISH summary Presented at the Intern. Symp. on Meteorol. Satellites, Paris, 21-24 May 1973
Avail: NTIS HC $3.00

Primary objectives of the data collection mission (mission 3) of the ESRO Meteosat program are discussed. These objectives are: collecting of meteorological and hydrological information, and receiving, without delay, alarm signals on abnormal phenomena, such as earthquakes and inundations. The facilities are described. They are: data collection platforms (DCP); geostationary satellite (Meteosat) at zero degrees longitude; and central processing installation at Frankfort (Germany). ESRO

N74-13402# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
ON THE NATURE OF LARGE CLEAR AIR GUSTS NEAR STORM TOPS
Anne Burns London Aeron. Res. Council 1973 48 p refs Supersedes RAE-TR-72036; ARC-33976
(ARC-CP-1248; RAE-TR-72036; ARC-33976) Avail: NTIS HC $4.50; HMSO 70p; PHI $2.95

Detailed analysis of a small patch of severe clear air turbulence recorded in a Canberra aircraft flying in the vicinity of storm tops, in Oklahoma, 1965, reveals the existence of a pattern in the variation of horizontal and vertical gust velocities. This pattern appears to arise from the presence of a complex system of equally-spaced vortex rolls, some with horizontal and some with tilted axes, embedded in turbulence of a more random nature. The largest gusts are found near the centers of the vortex rolls and are characterized by the sharpness of their gradients. The implications with respect to aircraft design loads of large gusts arising from such organized air motions is discussed, with particular reference to the power spectral approach.
Author (ESRO)

N74-13403# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Aug. 1973 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, AOUT 1973]
Aug. 1973 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during August 1973 are given. ESRO

N74-13404# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
MESOSCALE DIVERGENCE, VORTICITY, AND VERTICAL MOTION COMPARED TO RADAR AND RAINFALL PATTERNS
Donald M. Withers Jul. 1973 106 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-767558; A/M-Ref-73-4-T; ECOM-0073-T-8-68; TR-8) Avail: NTIS CSCL 04/2

Divergence, relative vorticity, and vertical motion are computed from mesoscale surface and upper-air network data collected by the National Severe Storms Laboratory, Norman, Oklahoma. Results are compared to radar and rainfall patterns recorded simultaneously. The two cases chosen are cold frontal passages; one has a strong squall line (April 26, 1969), and the other has a line of scattered echoes (May 16, 1969). Computed values of divergence, vorticity, and vertical motion are consistent with each other and, in general, with the radar and rainfall patterns. The largest difference is a large upward vertical motion computed for a region of dissipating echo.
Author (GRA)

N74-13405# Stanford Univ., Calif. Dept. of Operations Research.
A RANDOM MEASURE MODEL FOR THE EMISSION OF POLLUTANTS BY VEHICLES ON A HIGHWAY
Patricia A. Jacobs Feb. 1973 34 p refs
(Contract N00014-67-A-0112-0031; Grant NSF GP-31392; NR Proj. 042-265)
(AD-758666; SU-TR-29) Avail: NTIS CSCL 13/2

A mathematical theorem is developed and proven for the prediction of air pollution emissions by vehicles on highways. The theorem assumes the velocity of each vehicle to be independent of the velocities of other vehicles. Author

N74-13406# Weather Squadron (12th), Ent AFB, Colo.
MAP TYPE CATALOG FOR THE ILLINOIS WINDOW
Robert C. Sabin, Richard L. Nieman, and Hal W. Wold Nov. 1972 178 p refs
(AD-767217; Tech-Paper-72-4) Avail: NTIS CSCL 04/2

A standardized procedure has been developed to determine the synoptic map types which have occurred over a specified area window. The map type catalog is a summarization of information relating to these map types for the Illinois window. (There is a catalog for each of the 14 windows which cover the United States). The catalog includes characteristics of the map types and listings of each map in the data base (25 years of surface pressure maps) along with its most similar map type. The map type catalog is primarily intended for use with other forecast aids that stratify weather or specific weather parameters by map type. Once the catalog is prepared, a firm foundation has been established for the development of additional operational forecast techniques. (Modified author abstract) GRA

N74-13407# Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIANT HEAT TRANSFER IN A CLOUDY ATMOSPHERE
E. M. Feigelson 1973 196 p refs Transl. into ENGLISH of the publ. "Luchistyi Reploobmen i Oblaka" Leningrad, 1970 Sponsored by NOAA and NSF
(TT-72-50038) Avail: NTIS HC $5.25 CSCL 04B

Content survey of properties of stratiformis; Measurement of long-wave radiant flux and radiant heat gain; Radiant energy gain under stratiformis conditions; Effect of radiative heat exchange on the development of cloudiness. GRA

N74-13408# Texas A&M Research Foundation, College Station.
AN INSTRUMENT SYSTEM FOR MEASURING ATMOSPHERIC TURBULENCE AND THE ERRORS INHERENT IN USING IT
Franklin S. Darby Jul. 1973 167 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-767294; A/M-Ref-73-1-T; ECOM-0073-T-5-68; TR-5) Avail: NTIS CSCL 04/2

A computer controlled instrument system for the measurement of Reynolds stresses and turbulent heat fluxes in the atmospheric boundary layer is described from an engineering and functional point of view. The errors inherent in using this instrument system are analyzed both by a theoretical approach and by experimental runs of two instruments side by side. The errors in heat flux and Reynolds stress measurements were found to be approximately five percent. Author (GRA)

N74-13409# Hawaii Univ., Honolulu. Dept. of Meteorology.
THE TYPHOONS OF OCTOBER 1970 IN THE SOUTH CHINA SEA: INTENSIFICATION, DECAY AND OCEAN INTERACTION
Colin S. Ramage Jun. 1973 47 p refs
(AD-767031; UHMET-72-05; ENVPREDRSCHFAC-4-73) Avail: NTIS CSCL 04/2

In October 1970, the South China Sea experienced three typhoons. Meteorological and oceanographic data were examined in an attempt to explain why the typhoons underwent intensity changes while over the South China Sea. The clearest relationship was found with troughs in the upper tropospheric westerlies -- intensification accompanied development of a middle and high cloud plume streaming northeastward from the storm area.
Author (GRA)

N74-13410# Environmental Technical Applications Center (Air Force), Washington, D.C.
A RESUME ON THE STATE OF THE ART FOR SNOW FORECASTING
Charles L. Brenton, Jr. Jul. 1973 35 p refs
(AD-767214; USAFETAC-TN-73-6) Avail: NTIS CSCL 04/2

The document discusses the various predictors and techniques used in forecasting snowfall and in delineating between frozen and liquid precipitation. Techniques applicable to short range, midrange, and extended range forecasts are included. Fifty-three references concerning snow forecasting in the United States are itemized. Author (GRA)

N74-13411# Calspan Corp., Buffalo, N.Y.
AN INVESTIGATION OF THE MICROPHYSICAL MICROMETEOROLOGICAL PROPERTIES OF SEA FOG Annual Summary Report
Eugene J. Mack, Roland J. Pilie, and Warren C. Kocmond May 1973 48 p refs
(Contract N00019-73-C-0094; Proj. Sea Fog)
(AD-767376; CALSPAN-CJ-5237-M-1; ASR-1) Avail: NTIS CSCL 04/2

Measurements of the microphysical and micrometeorological characteristics of two fogs occurring at sea 30 nmi off the coast of California were obtained. The fogs exhibited formation features, vertical temperature structure and microphysical characteristics similar to those observed on shore in California coastal fog. One of the fogs formed over cold water, while the other formed over relatively warm water; in each instance, marked visibility improvements were observed at the surface downwind of abrupt gradients in surface water temperature. The observations also show that fog occurrence at the surface at distances exceeding 30 nmi off shore is definitely a diurnal effect and indicate that radiational cooling at the top of the fog is much more important than has been previously considered. Author (GRA)

N74-13412# Hawaii Inst. of Geophysics, Honolulu.
AN ATLAS OF PACIFIC ISLANDS RAINFALL Data Report No. 25
Ronald C. Taylor Aug. 1973 175 p refs
(Contract N00014-70-A-0016-0001)
(AD-767073; HIG-73-9) Avail: NTIS CSCL 04/2

The report contains monthly totals of rainfall for the period of record for 118 Pacific island stations selected from a list of 200. The mean, median, and extreme values, and standard deviation have been computed for each month and for the year. These data are the basis for a new estimate of mean monthly and annual rainfall for the tropical Pacific Ocean (30N 30S).
Author (GRA)

N74-13413# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
A STUDY OF THE APPLICABILITY OF WEATHER RADAR IN STREAMFLOW FORECASTING
Robert G. Curry Jul. 1973 65 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-767556; A/M-Ref-73-3-T; ECOM-0073-T-7-68; TR-7) Avail: NTIS CSCL 04/2

Streamflow routing techniques are applied for hydrograph synthesis to the 234 square mile East Yegua Creek basin in Central Texas. Digitized data for a grid size of 5 mi by 5 mi are obtained from a 10.3-cm radar and are used in the estimation of rainfall over the basin. These data are compared with rainfall measured by 27 recording and non-recording gages spaced uniformly over the basin. Hydrographs have been synthesized for four flood events based on radar-estimated and actually-observed rainfall. The results, when compared with the observed hydrographs, are encouraging. The routing coefficients, however, vary considerably with antecedent soil-moisture conditions, rainfall intensity, and time of the year. The primary difficulty in the use of radar estimated rainfall was that rainfall intensities were underestimated rather severely. The spatial variability of the rainfall was quite good and revealed the capability of radar to measure mesoscale variations of rainfall in a real-time sense.
Author (GRA)

N74-13414# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
MICROSTRUCTURE OF COLD FRONTS AND IMPLICATIONS AS TO THEIR DETECTION BY RADAR
Grant C. Aufderhaar Jul. 1973 79 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A)
(AD-767550; A/M-Ref-73-5-T; ECOM-0073-T-9-68; TR-9) Avail: NTIS CSCL 04/2

Data collected by two automatic micrometeorological towers and film from the radar film library at Texas A&M University were used to investigate the variations in some micrometeorological features during three cold-frontal passages. The results were: (1). Analysis of horizontal gradients of temperature and moisture in the lowest 32 m of the atmosphere and comparison of pictures of radar return reveal that large values of refractivity due to these gradients can be correlated with an organized pattern of radar return. (2). Wind fields were examined through the front and the presence of gust lines, evident in the microscale tower data, was not detected on the radar. (3). Vertical profiles of wind and dry-bulb and wet-bulb temperature were determined by use of the log-power relationship. Some regular changes were noted in the log-power, wind profile variables but those in the log-power dry-bulb and wet-bulb temperature profiles varied irregularly. Also, roughness length appeared to be a function of stability. (4). Soil and air temperatures through the frontal zone were compared by looking at the variations in flux of soil heat versus the temporal gradients of temperature in the atmosphere, with some regular results. Author (GRA)

N74-13415# Meteorology Research, Inc., Altadena, Calif.
WARM FOG AREA SEEDING STUDIES Final Report, 15 Feb. 1972 - 31 May 1973
Theodore B. Smith and Donald M. Takeuchi 20 Jul. 1973 25 p refs
(Contract F19628-72-C-0236; AF Proj. 7605)
(AD-767297; MRI-73-FR-1090; AFCRL-TR-73-0437) Avail: NTIS CSCL 04/2

Field operations to investigate the airborne area seeding concept on warm fog modification were carried out at Vandenberg Air Force Base, California, during July 1972. Two test operations were carried out. The first test was accompanied by aircraft control problems due, in part, to shifting winds. Results of the second test were tracked by radar, but higher winds than estimated caused the drops to be carried out as separate lines. The test

operations indicate some of the operational problems which may be encountered in carrying out the area seeding concept. (Modified author abstract) GRA

N74-13416# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
TEMPORAL VARIABILITY IN INTENSITY-HEIGHT PROFILES OF A SEVERE STORM USING DIGITAL RADAR DATA
Yates J. Canipe Jul. 1973 95 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-767564; A/M-Ref-73-6-T; ECOM-0073-T-10-68; TR-10) Avail: NTIS CSCL 04/2

Recent investigations based on data from the National Severe Storms Laboratory (NSSL), National Oceanic and Atmospheric Administration (NOAA), Norman, Oklahoma, have revealed numerous real-time applications of these data. Proper handling of these data can yield information on potentially severe storms that will improve greatly the ability to forecast their development and decay. Between 1600 CST and 1700 CST, two thunderstorm cells were observed to the southwest of Chickasha, Oklahoma, by NSSL radar. The first cell was in a decaying stage; however, the second cell remained somewhat docile until 1630 CST when it experienced almost explosive development. This study was concerned with what happened to the second cell. Detailed analysis indicated that satellite cells of possibly great importance were present. Composite maps were constructed to display the three-dimensional centers in two dimensions. Another type of analysis used to complete the investigation was the horizontal integration of liquid water. The feasibility of using digital radar in assessing storm development was investigated also. In particular, techniques were formulated that explain partially the explosive development associated with the tornado occurrence. (Modified author abstract) GRA

N74-13417# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INSTRUMENT FOR DETECTION OF CLOSE THUNDERSTORMS
I. M. Imyanitov and V. E. Karpusha 27 Aug. 1973 37 p refs Transl. into ENGLISH from the book "Meteorol. Equipment for Sci. Res." USSR, 1972 p 46-67
(AF Proj. 3005)
(AD-767035; FTD-MT-24-706-73) Avail: NTIS CSCL 04/2

The article discusses the principles of construction of instruments to detect thunderstorms. The construction and testing of one of the instruments - the thunderstorm signal indicator, is described. GRA

N74-13418# Army Electronics Command, Fort Monmouth, N.J.
LIDAR MEASUREMENT OF TEMPERATURE: A NEW APPROACH
James B. Mason Sep. 1973 19 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-767526; ECOM-5506) Avail: NTIS CSCL 04/2

It is shown that the thermodynamic distribution of rotational states within a molecular absorption band of a gas can be probed by means of lidar differential absorption to obtain measurements of the gas temperature. A technique for exploiting this is described, and preliminary calculations indicate that although relatively weak absorptions are involved, sensitivities should be sufficient for profile measurements of temperature in the atmosphere.
Author (GRA)

N74-13419# Research Inst. of National Defence, Sundbyberg (Sweden).
OFFSIDE 70. TREATMENT AND DESCRIPTION OF CERTAIN METEROLOGICAL MEASURING DATA [OFFSIDE 70. BEARBETNING OCH REDOVISNING AV VISSA METEOROLOGISKA MATEDATA]
Karl-Hugo Eriksson and Marja Hansson Oct. 1971 22 p refs In SWEDISH
(FOA-1-C-1425-C3/B3) Avail: NTIS HC $3.25

The mean values of wind rates (measured with a cup anemometer) and temperatures at measuring points at different heights over the ground are given. For the measuring periods with high sampling frequency, Richardson's number and standard deviation for wind speeds are also recorded. Treatment of the data has been carried out on a PDP-8 computer with the help of the program written in FOCAL. Author

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-13420* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
TERMINAL GUIDANCE SYSTEM Patent
Shu W. Gee, inventor (to NASA) Issued 4 Dec. 1973 15 p Filed 6 Mar. 1972 Supersedes N72-21632 (10 - 12, p 1638)
(NASA-Case-FRC-10049-1; US-Patent-3,776,455; US-Patent-Appl-SN-232021; US-Patent-Class-235-150.22; US-Patent-Class-235-150.26; US-Patent-Class-235.150.27; US-Patent-Class-244-77A; US-Patent-Class-244-77B; US-Patent-Class-343-108R) Avail: US Patent Office CSCL 17G

A terminal guidance system is described including a heading command subsystem and a glide-slope command subsystem which develop command signals for use in guiding an aircraft or other vehicle into a preselected heading and/or altitude at a terminal point. The heading command subsystem is responsive to certain input data and continuously develops command signals for use in directing the aircraft from a remote location to a terminal point so that upon arrival it has a preselected terminal heading. The glide-slope command subsystem is responsive to certain other input data and continuously develops command signals for use in controlling the rate of descent of the aircraft so that it will have a preselected altitude and glide-slope upon arrival at the terminal. Official Gazette of the U.S. Patent Office

N74-13421# Airborne Instruments Lab., Deer Park, N.Y.
MICROWAVE LANDING SYSTEM (MLS) DEVELOPMENT PLAN AS PROPOSED BY AIL DURING THE TECHNIQUE ANALYSIS AND CONTRACT DEFINITION PHASE OF THE NATIONAL MLS DEVELOPMENT PROGRAM. PART 3.0, VOLUME 3.2: APPENDIX A: SYSTEM TECHNIQUE SUMMARY. APPENDIX B: FUNCTIONAL REQUIREMENTS SUMMARY. APPENDIX C: DETAILED FEASIBILITY HARDWARE SPECIFICATIONS
27 Sep. 1972 96 p
(Contract DOT-FA72WA-2800; FAA Proj. 075-325-013)
(FAA-RD-73-166-Vol-3.2) Avail: NTIS HC $7.00

The development and characteristics of a microwave landing system for air traffic control are discussed. The subjects presented are: (1) functional requirements specification for the prototype system, (2) functional requirements specifications for the feasibility demonstration equipment, (3) detailed feasibility hardware specifications, (4) accuracies for angular guidance, and (5) distance measuring equipment specifications. Author

N74-13422*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
GENERAL AVIATION AIR TRAFFIC PATTERN SAFETY ANALYSIS
Loyd C. Parker 17 Jul. 1973 22 p refs Presented at the System Safety Soc. Symp., 17 Jul. 1973
(NASA-TM-X-69455; Paper-A-24) Avail: NTIS HC $3.25 CSCL 17G

A concept is described for evaluating the general aviation mid-air collision hazard in uncontrolled terminal airspace. Three-dimensional traffic pattern measurements were conducted at uncontrolled and controlled airports. Computer programs for data reduction, storage retrieval and statistical analysis have been developed. Initial general aviation air traffic pattern characteristics are presented. These preliminary results indicate that patterns are highly divergent from the expected standard pattern, and that pattern procedures observed can affect the ability of pilots to see and avoid each other. Author

N74-13423# Research Inst. of National Defence, Stockholm (Sweden).

PROPOSAL FOR A VISUAL SYSTEM OF SIMULATING A LANDING [FOERSLAG TILL VISUELLT SYSTEM FOER LANDNINGSSIMULERING]
Brian Hoegman, Ake Persson, and Goeran Oernberg Dec. 1971 27 p In SWEDISH
(FOA-2-C-2509-E4) Avail: NTIS HC $3.50

In order to increase the degree of simulation when simulating different flying situations, a proposal has been made for simulation of information from the external visual environment concerned with the landing of an aircraft. The solution presented gives a limited possibility for a dynamic simulation of the external visual environment. It is mainly intended for studying the performance of the pilot during landing and in this respect, it gives a relatively high degree of simulation. The proposal has been designed for use with a TV system and terrain models where the TV picture is modified depending on the position of the aircraft, and the pilots control reactions. Author

N74-13424# Elektronik fuer Luftfahrzeuge G.m.b.H., Stuttgart (West Germany).
A NEW TYPE OF ELECTRONIC LANDING SYSTEM FOR REGIONAL AIRPORTS [EIN NEUARTIGES ELEKTRONIK-LANDE-SYSTEM FUER REGIONALFLUGPLAETZE]
Roland Kissling 1973 8 p In GERMAN Presented at the DGLR-DGON Symp. on Neue Anflug- und Landeverfahren, Duesseldorf, 2-4 May 1973
(DGLR-Paper-73-020) Avail: NTIS HC $3.00

An electronic landing system for regional airports is proposed, based on instrument flight rules (IFR). The unsolved problem consists of ensuring a certain landing approach under IFR conditions for the most frequent types of weather. The existing GCA and ILS form too high an investment to be applied under these conditions. The system proposed is based on the concept of a simulated GCA or ILS using simple electronic means. The onboard equipment involved is equivalent to the minimum requirements for flight safety. Several ground equipment configurations are discussed. Small antennas are used for a 1 GHz receive frequency, and a transponder is proposed working at 4 GHz. ESRO

N74-13425# Naval Postgraduate School, Monterey, Calif.
APPLYING THE KALMAN FILTER TO THE EMITTER LOCATION PROBLEM USING AIRBORNE ANGLE-OF-ARRIVAL INFORMATION M.S. Thesis
Edward Harlin Mills Mar. 1973 202 p refs
(AD-767291) Avail: NTIS CSCL 17/3

A scheme to locate emitter positions using post flight processing of discrete airborne emitter bearing angles-of-arrival information and recorded aircraft position coordinates by Kalman filter techniques is developed. The signal intercept system as assumed to be operating in a multi-emitter environment and all data were sampled at discrete but time varying intervals. The aircraft position data is filtered directly in latitude and longitude using vector methods. An extended Kalman filtering scheme is developed to compute emitter coordinates directly in latitude and longitude. Author (GRA)

N74-13426# Texas A&M Univ., College Station. Dept. of Oceanography.
DEVELOPMENT AND INSTALLATION OF SPEED, HEADING AND TELETYPE INTERFACE TO MAGNAVOX MX206CA SATELLITE NAVIGATION SET
James Stasny and Alan Payne Aug. 1973 12 p refs
(Contract N00014-68-A-0308-0002)
(AD-767386; A/M-Ref-73-12-T) Avail: NTIS CSCL 17/7

The report describes the design and operation of interfacing for automatic external speed and heading sensors and also hard copy printout. GRA

N74-13427# Meta Systems, Inc., Santa Clara, Calif.
POTENTIAL CONFLICT PREDICTION AND ASSOCIATED FUNCTIONS FOR OCEANIC AIR TRAFFIC CONTROL AUTOMATION Final Report, Mar. 1972 - May 1973
Frank V. Giallanza, Charles P. Giallanza, and James C. Brown May 1973 59 p
(Contract DOT-FA72WA-2851)
(AD-767453; FAA-RD-73-73) Avail: NTIS CSCL 17/7

Algorithms to determine potential conflicts over an ocean airspace based on given vertical, lateral, and longitudinal separation criteria were developed. Additional algorithms to handle special cases have yet to be developed. Associated functions used by air traffic controllers to resolve conflict situations are also described. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-13428# Joint Publications Research Service, Arlington, Va.
FROM SCIENTIFIC RESEARCH TO THE ATOMIC INDUSTRY
A. M. Petrosyants 19 Nov. 1973 222 p refs Transl. into ENGLISH from the book "Ot Nauchnogo Poiska k Atomnoy Promyshlennosti" Moscow, Atomizdat, 1972 231 p
(JPRS-60584) Avail: NTIS HC $13.25

Excerpts from a book tracing the evolution of the nuclear power industry from the research stage to its present day development are presented. Topics discussed include high-energy physics, thermonuclear fusion, electric power engineering, small and low power nuclear power plants, prospects of nuclear power engineering, radioactive waste disposal, and nuclear centers. Author

N74-13429# California Univ., Livermore. Lawrence Livermore Lab.
OPTIMIZATION OF COLLECTOR EFFICIENCY FOR DIRECT ENERGY CONVERTERS FOR FUSION REACTORS
R. W. Moir, W. L. Barr, and T. N. Haratani 6 Jun. 1973 15 p refs
(Contract W-7405-eng-48)
(UCRL-51321) Avail: AEC Depository Libraries $4.00

A computer code written in FORTRAN and called COP calculates the ideal efficiency of a direct energy converter. The numerical procedure is to iteratively solve a set of equations derived from a standard variational method. The solution gives the potentials to be placed on the ideal collector elements as well as the efficiency of energy recovery. An arbitrary ion energy distribution can be used by reading in a table of numbers. Several distributions are analyzed and compared to an approximate efficiency, eta = 1 - 1/N where N is the number of collector stages. Author

N74-13430# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
MACHINING OF MULTIHOLE GRAPHITE BLOCKS
R. Bujas 18 Apr. 1973 6 p refs Presented at 7th Dragon Proj. Quality Control Working Party Meeting, Juelich, West Germany, 8-9 May 1973
(CEA-Conf-2320; Conf-730544-1) Avail: AEC Depository Libraries HC $3.00

Multihole graphite blocks for reactor fuel applications require fine tolerances. Experiments were performed using helicoidal drills, but required specifications could not be met. Testing with gun drills was performed and results showed that this method was acceptable and could be performed for industrial production. Control methods are described. NSA

N74-13431# Atomics International, Canoga Park, Calif.
REACTOR ASSEMBLY 5-kwe REACTOR THERMOELECTRIC SYSTEM
H. Rood, ed. 30 Jun. 1973 154 p refs
(Contract AT(04-3)-701)
(AI-AEC-13075) Avail: NTIS HC $9.75

The reactor assembly engineering performed for the 5-kW(e) reactor is summarized. Areas pertaining to the reactor as a whole are emphasized such as the nuclear effects, plenum hydraulics and in-core coolant mixing, mechanical and structural design of the reactor, vessel design, and core assembly procedure. Also

included is a discussion of reactor performance margins, and selected reactor layout drawings. Author (NSA)

N74-13432# Los Alamos Scientific Lab., N.Mex.
LASL CONTROLLED THERMONUCLEAR RESEARCH PROGRAM Annual Progress Report, period ending Dec. 1972
F. L. Ribe, comp. Jun. 1973 135 p refs Sponsored by AEC (LA-5250-PR) Avail: NTIS

The following topics are discussed: (1) Scyllac 5-m toroidal sector experiment; (2) liner Scyllac; (3) feedback experiments on Scyllac IV; (4) Scyllac Torus; (5) plasma diagnostics; (6) Scyllac computer and data acquisition; (7) Scyllac feedback system; and (8) electronics development. NSA

N74-13433# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
FUSION TECHNOLOGY STUDIES Progress Report, period ending 31 Dec. 1972
C. J. McHargue, comp. May 1973 110 p refs
(Contract W-7405-ENG-26)
(ORNL-TM-4156) Avail: NTIS

The material used in evaluation of the effects of helium content on the creep ductility was Nb-1% Zr and Nb, which contained helium produced both by alpha injection and by the reaction B-10(n, alpha). The Nb samples were annealed 1 h at 1150 C, the Nb-1% Zr 1h at 1200 C. The helium concentration achieved in one run was 18 at 1200 C. The helium concentration achieved in one run was 18 ppM (atomic) and in other run 1.7 ppM. Creep rupture and fracture elongation data are presented. NSA

N74-13434# Air Force Weapons Lab., Kirtland AFB, N.Mex.
LINCOLN EXPERIMENTAL SATELLITES 8 AND 9 HOT DROP TESTS Technical Report, 21 Apr. - 7 Jul. 1972
David L. Tate and Gilbert L. Zigler Oct. 1973 41 p
(AF Proj. 425A)
(AD-767584; AFWL-TR-73-171) Avail: NTIS CSCL 18/14

An adequate nuclear safety evaluation is conducted for any USAF launched mission which uses nuclear powered electrical generators. The Lincoln Experimental Satellites 8 and 9 (LES 8/9) are such a mission. The total inventory of plutonium-238 is in excess of 280,000 curies. Terminal velocity and impact orientation of the radioisotope thermoelectric generators (RTG) are required. Actual drop tests of simulated models were deemed the most appropriate and expeditious method for obtaining the necessary basic data. Two electric furnaces mounted on the cargo ramp of a C-130A aircraft were used in the conduct of the tests. Simulated components of the RTGs were dropped on White Sands Missile Range (WSMR), some at ambient temperature and the remainder at about 1500F. Optical and radar tracking along with motion picture coverage provided the necessary information on velocity and orientation. The hot body effect was observed, i.e., identical objects fell some 18 percent slower when dropped after being heated to about 1500F as opposed to those dropped at ambient temperature. The tests were completed ahead of schedule and exceeded all objectives. Author (GRA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-13435 Cornell Univ., Ithaca, N.Y.
ELECTRODYNAMICS OF DEFORMABLE CONTINUAL Ph.D. Thesis
Kolumban Hutter 1973 385 p
Avail: Univ. Microfilms Order No. 73-20163

The 5 thermodynamic theories based upon the 5 different Maxwell equations are compared to establish equivalence of the formations. This means that for a well posed initial and boundary value problem the solutions should agree in physically measurable quantities. Our conclusion is that aside from the dipole model of magnetization all theories are thermodynamically equivalent. One particular theory is then linearized for a magnetizable electrically and thermally conducting solid. The procedure of linearization is analogous. As an example of application of this linear theory outlined, the influence of a seismic wave on the geomagnetic field is discussed. Assumed is a homogeneous halfspace bounded by a horizontal plane. A uniform magnetic field is applied at an angle of the horizontal plane. During the passage of a Rayleigh surface wave, the halfspace is deformed and the magnetic fields are perturbed through the magnetoelastic interaction. It is shown that the perturbation of the geomagnetic field is about 0.00001 times the original field strength, when strains are 0.00001. Dissert. Abstr.

N74-13436* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TRANSMITTING AND REFLECTING DIFFUSER Patent
Lloyd S. Keafer, Jr., Ernest E. Burcher, and Leonard P. Kopia, inventors (to NASA) Issued 18 Dec. 1973 5 p Filed 30 Mar. 1972 Supersedes N72-28694 (10 - 19, p 2595) Continuation-in-part of abandoned US Patent Appl. SN-38816, filed 19 May 1970
(NASA-Case-LAR-10385-2; US-Patent-3,779,788; US-Patent-Appl-SN-239803; US-Patent-Class-117-33.3; US-Patent-Class-117-106A; US-Patent-Appl-SN-38816) Avail: US Patent Office CSCL 20F

A near-Lambertian diffuser is described which transmits and reflects ultraviolet light. An ultraviolet grade fused silica substrate is coated with vaporized fuse silica. The coating thickness is controlled, one thickness causing ultraviolet light to diffuse and another thickness causing ultraviolet light to reflect a near Lambertian pattern. Official Gazette of the U.S. Patent Office

N74-13437 Arizona Univ., Tucson.
THE MODULAR PRINCIPLE IN OPTICAL DESIGN Ph.D. Thesis
Romeo Iguico Mercado 1973 217 p
Avail: Univ. Microfilms Order No. 73-20624

A technique for initiating the optical design process without depending on the conventional thin lens layout is studied. It explores the potential and the feasibility of replacing thin lenses in the initial design of optical systems by lens modules. These are two-surface systems with fixed focal lengths having the property that they possess zero third-order spherical aberration and zero third-order astigmatism relative to a pair of pupil planes. The optical design module is the building block upon which the process of modular design is based. The modular technique has the advantage, over the conventional methods, that the resulting optical system, which is the starting point of the lens design process, has at least two of the third-order aberrations initially set equal to zero. Moreover, changes in the design configuration may be made by altering the parameters associated with each module without perturbing the required first-order properties of the system. Dissert. Abstr.

N74-13438 Cornell Univ., New York.
PERIODIC EXCITATION OF RELATIVISTIC ELECTRON BEAMS Ph.D. Thesis
Phillip Allen Sprangle 1973 117 p
Avail: Univ. Microfilms Order No. 73-20179

The excitation of a relativistic electron beam by means of both, a slow and fast waveguide structure, is presented. In both cases the beam is injected into a modified waveguide and interacts with the modes of the guide in such a way as to lose part of its energy. Some of this energy goes into microwave radiation. The slow and fast wave structure represents two basic mechanisms for producing intense microwave emission from a relativistic electron beam. In the analysis of the slow wave interaction process, a fluid or hydrodynamic approach is taken. Propagation of slow longitudinal waves in a waveguide can be accomplished by periodically loading the guide. A fluid approach is employed to examine the fast wave excitation of a magnetically modulated relativistic electron beam. The beam is modulated by injecting it into a small spatially periodic magnetic field region within the guide. Dissert. Abstr.

N74-13439 British Library Lending Div., Boston Spa (England).

IR TECHNOLOGY SHOWS UP DEFECTS WITH HEAT
J. Ahlstroem 3 Sep. 1973 16 p Transl. into ENGLISH from Eleteknik Med. Aktuell Elektronik (Sweden), no. 12, Dec. 1972 p 16-19
(BLL-DRIC-Trans-3179-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

New and improved IR detectors have increased the use of IR technology in industry, medicine and military engineering practice. Typical fields of application are contact free temperature measurement, thermography (heat picture technology), spectral analysis and alarm system. Author

N74-13440 British Library Lending Div., Boston Spa (England).
MAGNETIC AFTER-EFFECT IN THE INTERMETALLIC COMPOUND SmCo5
V. S. Kraposhin and Ya. L. Linetskii [1973] 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern Met. (USSR), no. 3, 1973 p 128-129
(BLL-M-21721-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Magnetization curves, recovery curves and curves for the relationship of specific permanent magnetization to the demagnetizing field were measured for specimens of SmCo5 powder which had been pulverized for different lengths of time, and pickled. The degree of magnetization and the shape of the curve for the relationship of permanent magnetization to the demagnatizing field depend on the time for which specimens are held in a constant demagnetizing field. The relative change in magnetization in particular fields and the magnetization relaxation time are governed by the structural state of the powder. Author

N74-13441 Catholic Univ. of America, Washington, D.C.
TRANSMISSION OF INTERNALLY-GENERATED TRANSIENT ACOUSTIC PULSES THROUGH A SPHERICAL SHELL Ph.D. Thesis
Robert Thomas Menton 1973 93 p
Avail: Univ. Microfilms Order No. 73-21742

The effects of a fluid-loaded spherical shell on the propagation to the far field of an internally generated, transient acoustic pulse were analytically determined. The pulse was generated by a spherical transducer located concentrically within the shell and having a specified spatial and temporal surface velocity distribution. Since accurate prediction of transient response requires a shell theory that is valid for moderately high frequencies, a higher order linear shell theory incorporating the effects of transverse shear and rotary inertia was used. The fluid between the transducer and the shell, and the fluid external to the shell, were assumed to obey the linear acoustic wave equation. The spatial dependence of the transmitted pulse was expanded in a series of spherical harmonics; the temporal dependence was found by numerical inversion of a Fourier transform. Dissert. Abstr.

N74-13442 Rice Univ., Houston, Tex.
DOMAIN WALL VELOCITY IN MAGNETIC MATERIALS Ph.D. Thesis
David Samuel Bartran 1973 68 p
Avail: Univ. Microfilms Order No. 73-21534

The theory of steady-state and transient domain wall velocity is reviewed and correlated with observed data in Bloch wall permalloy thin films. The theory is empirically modified to account for the extensive flux closure characteristic of thin film walls and the observed wall widths. Experimentally, the average wall velocity is obtained with interrupted pulse techniques, and it is observed that as long as the field duration is greater than 20 ns and the wall displacement per pulse of drive field exceeds a critical distance associated with the wall coercive force interaction the data is independent of the field duration. In this limit, the effect of wall contraction is quite pronounced and is manifested as a peak in the velocity-field curve and a region of negative differential mobility. Dissert. Abstr.

N74-13443 Texas A&M Univ., College Station.
AN INVESTIGATION RELATING THE THERMOMAGNETIC FORCE IN POLYATOMIC GASES TO THE CHAPMAN-ENSKOG THEORY Ph.D. Thesis
John Taboada 1973 86 p
Avail: Univ. Microfilms Order No. 73-21708

The thermomagnetic force is a magnetic field induced change in the radiometric force exerted on an object suspended in a heat conducting polyatomic gas. An investigation of the thermomagnetic force in gases of diatomic molecules N2, CO, and HD at 300 K and the spherical molecule NH3 was conducted with a very sensitive microstress gauge apparatus in which systematic changes in the field tensorial quantity in the region of the detecting object were induced with a set of isothermal boundaries of well defined geometry. It is shown from the experimental results that the thermomagnetic force can be explained by means of a stress tensor component (in the bulk) calculated from the second order Chapman-Enskog approximation of the quantum mechanical Waldman-Snider transport equation. Dissert. Abstr.

N74-13444# Research Inst. of National Defence, Stockholm (Sweden).
OPTICAL DETERMINATION OF THE CORRELATION COEFFICIENT
Sten Nyberg Nov. 1971 14 p refs
(FOA-2-C-2499-E1) Avail: NTIS HC $3.00

Correlation is a measure of similarity between two images. Maximum correlation occurs when the two images are identical. An optical method for the measurement of the correlation coefficient is described. The method uses the intensity transmission of the images. In order to get the value unity for the correlation coefficient for two identical images, normalization is used. Experiments give estimated values of accuracy and precision of, about 4%. Author

N74-13445# Research Inst. of National Defence, Stockholm (Sweden).
INVESTIGATION INTO THE EFFECTS OF WIND AND TEMPERATURE GRADIENTS ON A SOUND MEASURING SYSTEM [UNDERSOEKNING AV VIND- OCH TEMPERATUR GRADIENTERS INVERKAN PA ETT LJUDMAETSYSTEM]
Arne Gjaerdman Feb. 1972 26 p refs In SWEDISH
(FOA-3-C-3708-E1) Avail: NTIS HC $3.50

Effects of wind and temperature gradients on the accuracy of acoustic trackers (sound locators) and on the accuracy of reducing the microphone base length were explored. It can be established from the series of tests carried out, that a more accurate target detemination is accomplished when these gradients are taken into account. A reduction of the base length with similar measurements resulted in no demonstrable, statistical deterioration. The standard deviations however, increased in both cases. Author

N74-13446# Research Inst. of National Defence, Stockholm (Sweden).
DESCRIPTION OF THE WIENER SPECTRUM WITH DIGITAL AND OPTICAL TECHNIQUES: A COMPARISON [FRAMSTALLNING AV WIENERSPEKTRUM MED DIGITAL OCH OPTISK TEKNIK: EN JAMFORELSE]
Jan-Olof Eklundh, Sten Nyberg, and Lars Nystrom Dec. 1971 21 p refs In SWEDISH
(FOA-2-C-2506-E1) Avail: NTIS HC $3.25

A description is given of how the Wiener spectrum of a photograph can be produced by digital techniques. Digital calculations which use the fast Fourier transforms, as well as the optical version which uses coherent optics, are described. The Wiener spectra obtained are recorded, including one in the form of a picture, and show good agreement between the two methods. Author

N74-13447# California Univ., Berkeley. Lawrence Berkeley Lab.
HIGH ENERGY HEAVY IONS: A NEW AREA FOR PHYSICS RESEARCH
Harry H. Heckman 15 Jun. 1973 37 p refs Presented at 5th Intern. Conf. on High Energy Phys. and Nucl. Struct., Uppsala, 18-22 Jun. 1973
(Contract W-7405-eng-48)
(LBL-2052; Conf-730642-7) Avail: NTIS HC $4.00

Emerging from the first heavy ion experiments at the Bevatron are preliminary results that reveal high energy ion research to be a promising and stimulating new area of physics research, pertinent to elementary particles, nuclear structure, and

cosmic rays. Among the heavy ion physics experiments in progress at the Bevatron are studies on the fragmentation of projectile and target nuclei, coherent pion production, and the production and detection of high energy hypernuclei. The experiments on the fragmentation of beam nuclei have shown specific relevance to contemporary theory on inclusive reactions, particularly to the concept of factorization, i.e., the modes of fragmentation of beam nuclei are independent of the target nucleus. Complementary experiments on the fragmentation of target nuclei are concerned with the characteristics differences between the production of light and heavy fragments from heavy element targets
Dissert. Abstr.

N74-13448# McElroy (Ralph) Co., Austin, Tex.
PRODUCTION OF V3Ga SUPERCONDUCTIVE MAGNET (1)
Y. Furuto, C. Ikeda, Y. Tanaki, T. Suzuki, S. I. Meguro, and I. Inoue Jun. 1973 3 p Transl. into ENGLISH of "V3Ga choadendo Magnunetto no Shisaku (1)", Japanese report Sponsored by AEC Prepared for Los Alamos Sci. Lab.
(LA-TR-73-15) Avail: NTIS HC $3.00
A magnet was produced using V3Ga wire and its use as a winding for high magnetic field magnets was examined. The results of the V3Ga coil test are shown. Based on these results a 160 kG magnet is under design and production; its dimensions are shown. NSA

N74-13449# Rochester Univ., N.Y. Dept. of Physics and Astronomy.
ELECTROMAGNETIC RADIATION AND ITS INTERACTION WITH MATERIAL MEDIA AND ITS CONTINUATION INTERACTION OF ELECTROMAGNETIC RADIATION WITH BULK MATTER Final Report, 1 Aug. 1971 - 31 Jul. 1973
Emil Wolf Aug. 1973 20 p refs
(Grants DA-ARO(D)-31-124-71-G11;
DA-ARO(D)-31-124-72-G176)
(AD-767278; AROD-9407-27-P) Avail: NTIS CSCL 20/6
The investigations were chiefly concerned with radiation from moving charges, with molecular treatment of electrodynamics of material media and with coherence in interaction of quantized field in matter. Results of these investigations are contained in 25 papers. Titles, authors and journal references are listed and the main results are given. Author (GRA)

N74-13450# Army Electronics Command, Fort Monmouth, N.J.
THE EFFECT OF HELICOPTER NOISE ON COMMUNICATION AND HEARING
Thomas A. Giordano and Gerard C. Keane Aug. 1973 151 p refs
(DA Proj. 1T0-61101-A-91A; DA Proj. 1F2-63207-DB-97)
(AD-767222; ECOM-4140) Avail: NTIS CSCL 20/1
The effects of CH-47 (CHINOOK) helicopter noise on the aviator's hearing and on communication system intelligibility are serious ones. The effort described by this report is aimed at reducing the sound pressure levels at the aviator's ears while maintaining high intelligibility and quality in the communication system. The overall problem is first defined. The noise levels inside all areas of the CH-47 were found to exceed the hearing damage risk criteria set forth by the Surgeon General. Even with hearing protectors, the aviator is limited to the time he may fly without undue risk to his hearing. The electrical characteristics of the communication system were determined. Non-linear frequency responses of the microphone and earcup were detected. These resonances cause emphasis of those frequencies in which the ear is most sensitive. The poor noise cancelling ability of the M-87 microphone at high frequencies cause low signal to noise ratios in the communication system. An intelligibility vs. in-ear dBA level study was run to evaluate the potential success of an ideal perfect noise cancelling microphone and other microphone modifications. GRA

N74-13451# Naval Research Lab., Washington, D.C.
ELECTROMAGNETIC BEAM FIELDS
William H. Carter 31 Aug. 1973 31 p refs
(RR0110741)
(AD-767310; NRL-7576) Avail: NTIS CSCL 20/6
An electromagnetic beam is defined using mathematical properties of the associated angular spectrum of plane waves. It is found that the usual paraxial theory for the Hermite Gaussian or Laguerre Gaussian beams, produced by some lasers, can be replaced by a more general theory which is precise according to Maxwell's equations. In this theory the beams exhibit an amplitude distribution over any plane normal to the direction of propagation which can be described using prolate spheroidal wave functions. As the degree of collimation is increased, these beams asymptotically take on the familiar Gaussian amplitude cross section. However, as the divergence from focus is increased, these beams asymptotically approach modified dipole fields. It is found that two, mutually exclusive, classes of beam fields exist. For each beam in one class there is always a complementary beam in the other class. As the degree of collimation is increased, complementary beams become almost identical. Complementary beams contain electromagnetic components which are related to one another in the same manner as between the fields of similar electric and magnetic multipoles. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-13452 British Library Lending Div., Boston Spa (England).
ON THE EFFECTS OF MOLECULAR INTERACTION ON THE SPECTRAL TRANSPARENCY OF INFRA-RED ACTIVE GASES
G. Germershausen and H. Luther 3 Sep. 1973 25 p refs Transl. into ENGLISH from Ber. Bunsenges. Physik. Chemie (Weinheim), v. 67, no. 2, 1963 p 205-212
(BLL-DRIC-Trans-3227-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons
The effect of a foreign gas on the extinction coefficient of an absorbent gas, in pressure-broadening with a definite gap width, is considered. Also studied is the effect of the foreign gas on the population of the states of the absorbent gas which take part in the energy transfer through absorption. Author

N74-13453*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOME NEW RESULTS ON ELECTRON TRANSPORT IN THE ATMOSPHERE
Martin J. Berger (NBS, Washington, D.C.), Stephen M. Seltzer (NBS, Washington, D.C.), and Kaichi Maeda [1972] 52 p refs Sponsored in part by ONR
(NASA-TM-X-69898) Avail: NTIS HC $4.75 CSCL 20H
The penetration, diffusion and slowing down of electrons in a semi-infinite air medium has been studied by the Monte Carlo method. The results are applicable to the atmosphere at altitudes up to 300 km. Most of the results pertain to monoenergetic electron beams injected into the atmosphere at a height of 300 km, either vertically downwards or with a pitch-angle distribution isotropic over the downward hemisphere. Some results were also obtained for various initial pitch angles between 0 deg and 90 deg. Information has been generated concerning the following topics: (1) the backscattering of electrons from the atmosphere, expressed in terms of backscattering coefficients, angular distributions and energy spectra of reflected electrons, for incident energies T(o) between 2 keV and 2 MeV; (2) energy deposition by electrons as a function of the altitude, down to 80 km, for T(o) between 2 keV and 2 MeV; (3) the corresponding energy depostion by electron-produced bremsstrahlung, down to 30 km; (4) the evolution of the electron flux spectrum as function of the atmospheric depth, for T(o) between 2 keV and 20 keV. Energy deposition results are given for incident electron beams with exponential and power-exponential spectra. Author

N74-13454# Joint Publications Research Service, Arlington, Va.
ACCELERATION OF IONS BY A RELATIVISTIC ELECTRON

BEAM

A. A. Plyutto, K. V. Suladze, S. M. Temchin, G. P. Mkheidze, Ye. D. Korop, B. A. Tskhadaya, and I. V. Golovin 29 Nov. 1973 10 p refs Transl. into ENGLISH from Zh. Tekhn. Fiz. (Moscow), v. 43, no. 8, 1973 p 1627-1631
(JPRS-60651) Avail: NTIS HC $3.00

The effect of ion acceleration in an electron beam was observed initially when obtaining nonrelativistic electron beams from a plasma emitter. Protons and ions of carbon with maximum energies of 4 - 5 and 10 - 20 Mev were recorded in experiments for an average of 200 - 300 kev electron energy. A linear rise in the energy of ions with an increase in the energy of electrons was observed in the range of 10 - 200 kilovolt accelerating voltages under optimal conditions for ion acceleration. This opened up the possibility for creating an electron jet ion accelerator at 10 - 100 Mev using 1 - 2 Mev relativistic electron beams. Some investigations in this direction are conducted using high current electron resonator accelerators. Author

N74-13455# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
COMMENTS ON THE THEORY OF SATELLITE BANDS
J. Cooper 18 Nov. 1973 29 p refs Sponsored by Colo. Univ. and NBS
(JILA-111) Avail: NTIS HC $3.50

Various aspects of the theory of the formation of satellite bands are considered. In particular, semi-classical and classical expressions for the line shape are derived from the quantum mechanical Born-Oppenheimer expression by the use of JWKB wave functions. The statistical weight factors associated with curved classical trajectories are emphasized and the semi-classical interpretation is examined of quantum oscillations. Author

N74-13456*# Purdue Univ., Lafayette, Ind. High Temperature Gas Dynamics Lab.
THERMOCHEMICAL NONEQUILIBRIUM IN ATOMIC HYDROGEN AT ELEVATED TEMPERATURES
Robert Kenmer Scott Dec. 1972 184 p refs
(Grant NGR-15-005-129)
(NASA-CR-136277; HTGDL-8) Avail: NTIS HC $11.25 CSCL 20H

A numerical study of the nonequilibrium flow of atomic hydrogen in a cascade arc was performed to obtain insight into the physics of the hydrogen cascade arc. A rigorous mathematical model of the flow problem was formulated, incorporating the important nonequilibrium transport phenomena and atomic processes which occur in atomic hydrogen. Realistic boundary conditions, including consideration of the wall electrostatic sheath phenomenon, were included in the model. The governing equations of the asymptotic region of the cascade arc were obtained by writing conservation of mass and energy equations for the electron subgas, an energy conservation equation for heavy particles and an equation of state. Finite-difference operators for variable grid spacing were applied to the governing equations and the resulting system of strongly coupled, stiff equations were solved numerically by the Newton-Raphson method. Author

N74-13457*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANGULAR DISTRIBUTIONS AND POLARIZATION FRACTIONS OF HELIUM RESONANCE RADIATION (n 1P - 1 1S) IN THE EXTREME ULTRAVIOLET
M. J. Mumma, M. Misakian, W. M. Jackson, and J. L. Faris Dec. 1973 33 p refs
(NASA-TM-X-70543; X-691-73-372) Avail: NTIS HC $3.75 CSCL 20H

Angular intensity distributions of helium (n 1P - 1 1S) resonance photons with respect to the exciting electron beam are presented. The angular intensity distributions were measured at selected electron impact energies from 25 eV (near threshold) to 150 eV. Polarization fractions (Pi) were obtained by analyzing the data in terms of the theoretical relation between angular intensity distribution and Pi, i.e. Iota (theta) = Iota (90) (1 - Pi sq cos theta). The experimental values for Pi are compared with recent theoretical results and with previous experimental values for the (3 1P - 2 1S) transition. Author

N74-13458# Argonne National Lab., Ill.
HELIUM-ION IRRADIATION OF VANADIUM AND NIOBIUM
S. K. Das and M. Kaminsky 1972 15 p refs Presented at Conf. on Defects and Defect Clusters in bcc Metals and their Alloys, Gaithersburg, Md., 14-16 Aug. 1973 Sponsored by AEC
(Conf-730813-1) Avail: NTIS

Helium bubble and blister formation in vanadium and niobium by 0.5-MeV helium ion irradiation was investigated. The average blister size observed in polycrystalline samples irradiated at room temperature was smaller for the 40% cold worked vanadium samples than for the annealed ones. This difference in blister size is less pronounced for irradiation at 900 C. The blisters formed on the (111) surface plane of vanadium monocrystals by irradiation at 650 to 750 C with channeled 4He(+) ions exhibit distinct crystallographic features similar to those reported earlier for (111) niobium monocrystals. These features can be understood on the basis of certain active slip planes intersecting the (111) surface plane during blister formation. The effects of irradiation temperature on the mechanism of blister formation are discussed. Author (NSA)

N74-13459# Sandia Labs., Albuquerque, N.Mex.
TRANSIENT CHANGE IN Q AND FREQUENCY OF AT-CUT QUARTZ RESONATORS FOLLOWING EXPOSURE TO PULSE X-RAYS
J. C. King and H. H. Sander 1973 12 p refs Presented at Conf. on Nucl. and Space Radiation Effects, Logan, Utah, 23 Jul. 1973 Sponsored by AEC
(SLA-73-5336; Conf-730703-7) Avail: NTIS HC $3.00

Study of the transient behavior of the AT-cut quartz resonators following pulsed irradiation has been extended. In addition to 125 MHz 5th overtone crystal units previously reported, both 32 MHz and 5 MHz 5th overtone units have been studied using several different oscillator circuits, one of which is designed to give the transient resistance at series resonance sub Rs, as well as frequency as function of time after pulse exposure sub Rs, is proportional to the acoustic loss of the resonator. With but one notable exception the annealing kinetics of the transient frequency offset following pulse irradiation obeys a t to the minus 1/2 relationship over three to four decades in time, indicative of a ID diffusion limited trapping of uncorrelated defects in the crystal lattice. The most significant observations of the post irradiation behavior of sub Rs is the relatively large sub Rs increase in natural quartz resonator Author (NSA)

N74-13460# Johns Hopkins Univ., Baltimore, Md.
NUCLEAR MOMENTS AND NUCLEAR STRUCTURE Annual Progress Report, 1 Jan. - 31 May 1973
L. Madansky and Y. K. Lee 1973 29 p refs
(Contract AT(11-1)-3274)
(COO-3274-8) Avail: NTIS HC $3.50

The nuclear quadrupole couplings of N-12 in single crystals of Be and Mg were measured. Moreover, the relative intensities of the resonance lines arising from two stopping sites for B-12 in Be seemed to depend upon the orientation of the crystalline c-axis with respect to the recoil direction. An experiment was designed to investigate this orientational dependence. A polarimeter was used to measure the linear polarization of gamma rays from very high spin states in nuclei produced in (HI,xn) reactions. The Moessbauer effect was used to study temperature spikes in solids following Coulomb excitation and the magnetic properties of antiferromagnetic Ni-Fe alloys. Work on the development of a high count rate gas flow proportional counter is discussed. New projects on the diffusion of charged particles and radiative effects following heavy ion collisions are briefly described. NSA

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-13461 California Univ., San Diego.
LINEAR SIDEBANDS Ph.D. Thesis
George John Morales 1973 137 p
Avail: Univ. Microfilms Order No. 73-19780

The existence of a new mechanism is established by which

waves at nearby frequencies can be excited when a small amplitude, monochromatic, electron plasma wave is launched in a collisionless plasma. The amplitude of these excited sidebands depends linearly on the amplitude of the launched wave, hence they have been named linear sidebands. A striking feature of linear sidebands is that their amplitude exhibits large spatial oscillations, while the amplitude of the wave exciting them damps monotonically according to the linear theory of Landau. Linear sidebands arise from the interaction of the launched wave with preexisting, low frequency, streaming perturbations in the electron velocity distribution function. Perturbations of this type can arise naturally in a plasma from effects that are well localized in space. Dissert. Abstr.

N74-13462 Illinois Univ., Chicago.
CONTINUUM PLASMA IN LOW REYNOLDS NUMBER HOMOLOGOUS TURBULENT SHEAR FLOW Ph.D. Thesis
Thomas Joseph Marcisz 1973 160 p
Avail: Univ. Microfilms Order No. 73-20042

The turbulence structure of weakly ionized, continuum plasma in homologous shear flow is analyzed with emphasis on the turbulent transport and the mean square fluctuation properties of the ionized species. The mean gradients of the velocity and the ionized specie number density are considered to be uniform and it is assumed that the turbulence Reynolds number is small and the turbulence field is locally homogeneous in order to effect closure of the dynamic equations of turbulence. The statistical behavior of the ions and the electrons is found to be insensitive to applied electric field, and the statistical behavior of the electrons is found to approach that of the ions for increasing values of the ionized specie mean number density gradient and for increasing mean velocity gradient. Dissert. Abstr.

N74-13463 Rice Univ., Houston, Tex.
PLASMA WAVES INDUCED BY HF RADIO WAVES Ph.D. Thesis
Ivan Jelinek Kantor 1973 176 p
Avail: Univ. Microfilms Order No. 73-21567

When the ionospheric F region is illuminated with a strong O-mode HF radio wave, excitations of longitudinal plasma and acoustic waves are observed by radar scattering. The structure of the excited waves, variability with local parameters, time and experimental conditions are described. The observations are compared with the parametric instability theory. The purely growing mode, the decay instability and the images are identified in the observed spectra. The calculated threshold indicates that the HF transmitting system at Arecibo can excite these instabilities. The decay of the plasma line is shown to be given by the electron-ion collision frequency and the photoelectron Landau damping, which opens a new method of measurement of the collision frequency in the F region. The standing wave structure of the electric field near the reflection is shown to play an important role on the amplitude of the plasma line when the heater frequency is slightly below the critical frequency. Dissert. Abstr.

N74-13464 Auburn Univ., Ala.
HEAT TRANSFER IN MAGNETOHYDRODYNAMIC LAMINAR SOURCE FLOW BETWEEN TWO PARALLEL DISKS Ph.D. Thesis
Mohamed Salah Khader 1973 132 p
Avail: Univ. Microfilms Order No. 73-21760

The steady axisymmetrical laminar source flow of an incompressible electrically conducting fluid between two circular parallel disks in the presence of a transverse applied magnetic field is analyzed. A solution for the equations of motion is obtained by expanding the velocity and the pressure distributions in terms of power series of the reciprocal of the radial coordinate. Velocity and induced magnetic fields and pressure and shear stress distributions are determined. The energy equation is then solved numerically for the temperature distribution, where both Joulean and viscous heating are included. It is found that the applied magnetic field influences both the hydrodynamic and thermal fields. Both local and average Nusselt numbers for the case of constant wall temperature are evaluated. For fluids of moderate and high Prandtl numbers, the Nusselt number is seen to be a strong function of both Hartmann number and a heat generation parameter together with a modified Peclet number. Dissert. Abstr.

N74-13465 Stanford Univ., Calif.
INTERFEROMETRIC STUDY OF THE INTERACTION OF AN IONIZING SHOCK WAVE WITH A TRANSVERSE MAGNETIC FIELD Ph.D. Thesis
William Joseph Loubsky 1973 174 p
Avail: Univ. Microfilms Order No. 73-20494

A shock tube containing a magnetohydrodynamic generator section of the Faraday type was used to study the wave interaction phenomena when ionized argon penetrated a strong transverse magnetic field. Time resolved optical interferometry provided both a visualization and a quantitative assessment of the flow. Electron and mass density as well as induced current measurements were analyzed and compared qualitatively with a one-dimensional theory that includes real gas effects. Dissert. Abstr.

N74-13466*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LIQUID METAL MAGNETOHYDRODYNAMICS (LMMHD) TECHNOLOGY TRANSFER FEASIBILITY STUDY. VOLUME 1: SUMMARY
R. L. Phen, Lance G. Hays, and M. E. Alper 18 May 1973 60 p Sponsored by NASA 2 Vol.
(NASA-CR-136197; JPL-1200-59-Vol-1) Avail: NTIS HC $5.00 CSCL 20I

The potential application of liquid metal magnetohydrodynamics (LMMHD) to central station utility power generation through the period to 1990 is examined. Included are: (1) a description of LMMHD and a review of its development status, (2) LMMHD preliminary design for application to central station utility power generation, (3) evaluation of LMMHD in comparison with conventional and other advanced power generation systems and (4) a technology development plan. One of the major conclusions found is that the most economic and technically feasible application of LMMHD is a topping cycle to a steam plant, taking advantage of high temperatures available but not usable by the steam cycle. Author

N74-13467*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LIQUID METAL MAGNETOHYDRODYNAMICS (LMMHD) TECHNOLOGY TRANSFER FEASIBILITY STUDY. VOLUME 2: APPENDIXES
R. L. Phen, Lance G. Hays, and M. E. Alper 18 May 1973 198 p refs Sponsored by NASA 2 Vol.
(NASA-CR-136198; JPL-1200-59-Vol-2) Avail: NTIS HC $12.00 CSCL 20I

For abstract, see N74-13466.

N74-13468*# TRW Systems Group, Redondo Beach, Calif.
TRW PLASMA WAVE EXPERIMENT FOR THE IMP-H MISSION Final Report, Feb. 1971 - Feb. 1973
P. F. Virobik and F. L. Scarf Oct. 1973 23 p refs
(Contract NAS5-11384)
(NASA-CR-132887; TRW-17557-6003-RU-00) Avail: NTIS HC $3.25 CSCL 20I

The IMP-H plasma wave experiment is designed to extend knowledge of wave-particle interactions in the disturbed cislunar region, the distant geomagnetic tail, the upstream solar wind, and the flanks of the magnetosheath-shock interface. It is expected to identify plasma instabilities, study particle acceleration and heating at collisionless shocks and other discontinuities, analyze turbulent conductivity and field line merging, and provide new information on dissipation processes for suprathermal particles. Instrumentation for the plasma wave experiment is designed to measure local electric and magnetic field oscillations over the frequency range 10 Hz to 100 kHz. A 24 inch electric dipole, a 7 inch diameter air core search coil, and the associated preamplifiers are mounted on a spacecraft counterweight boom. The frequency range of 10 Hz to 100 kHz for both E and B is processed using an eight-channel spectrum analyzer located in the instrument main-body package (a standard IMP trapezoidal module, 3 inches high). Electric fields as small as 10-100 microvolts/meter and magnetic signals as small as 1-3 milligamma will be detected. Author

N74-13469# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
EVIDENCE OF STIMULATED BACKSCATTERING OF LASER RADIATION FROM A LASER PRODUCED PLASMA
K. Eidmann and R. Sigel Dec. 1972 22 p refs Presented at Intern. Conf. on the Interaction of Laser with Matter, Marly le Roi, France, 9-13 Oct. 1972
(IPP-4-46; Conf-721099-2) Avail: AEC Depository Libraries HC $3.25

The reflection of laser light from a laser-produced deuterium plasma was experimentally investigated. Strong evidence of stimulated backscattering was obtained. Author (NSA)

N74-13470# Paris Univ., Orsay (France).
STUDY OF ELECTRON-ION RECOMBINATION MECHANISM IN THE VAPOR OF IONIZED Cs Ph.D. Thesis
G. Saint-Hilaire 1972 110 p refs In FRENCH
(FRNC-TH-375) Avail: AEC Depository Libraries HC $7.50

The evolution during the afterglow period of a Cs plasma was studied for pressures between 0.02 and 4 torr. A microwave heating system which enables direct measurements to be made of the dependence of the overall recombination coefficients on the electronic temperature was studied. It was demonstrated that the collisional and radiative recombination mechanism is predominant at the beginning of the afterglow but that number of mechanisms (possibly conversion reactions) then determine the evolution of the plasma, the effect occurring more and more precociously with higher plasma pressures. The efficiency of this mechanism varies approximately with the square root of the pressure. NSA

N74-13471# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
FIVE-WAVE INTERACTION: A POSSIBILITY FOR ENHANCEMENT OF OPTICAL OR MICROWAVE RADIATION BY NONLINEAR COUPLING BY EXPLOSIVELY UNSTABLE PLASMA WAVES
H. Wilhelmsson and V. P. Pavlenko 1972 19 p refs
(ITF-72-153-E) Avail: AEC Depository Libraries HC $3.00

A rigorous solution is obtained to the problem of five-wave interaction in a plasma medium for the case where two of the waves are transverse electromagnetic waves, and the remaining three waves are longitudinal plasma or beam waves. The effects of nonlinear instability are studied in a coherent wave description. Author (NSA)

N74-13472# California Univ., Livermore. Lawrence Livermore Lab.
PROCEEDINGS OF THE SIXTH CONFERENCE ON NUMERICAL SIMULATION OF PLASMAS
1973 89 p refs Conf. held at Berkeley, Calif., 16-18 Jul. 1973
(Contract W-7405-eng-48)
(Conf-730710-1) Avail: NTIS HC $5.45

A total of 40 papers are included. The papers are divided into sessions as follows: (1) methods, (2) electromagnetic codes, and (3) fluids and magnetohydrodynamics. NSA

N74-13473# Transtek Associates, Reading, Mass.
EXPERIMENTS IN CONFINING A PLASMA IN A MULTIMIRROR MAGNETIC TRAP
G. I. Budker, V. V. Danilov, E. P. Kruglyakov, D. D. Ryutov, and E. V. Shunko Jun. 1973 32 p refs Transl. into ENGLISH from the Russian report IYAF-22-73
(Contract AT(11-1)-3073)
(MATT-Trans-108; IYAF-22-73) Avail: NTIS HC $3.75

The experiments were performed in a low temperature alkaline plasma. A study was made of the density distributions along the trap axis under stationary conditions and also the plasma decay after pulsed disconnection of its source. It turned out that the movement of the plasma along the field is essentially retarded on coverting to the multimirror configuration in accordance with the previously published theory. Author (NSA)

N74-13474# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
LOW FREQUENCY PLASMA WAVES NON-LINEAR INTERACTIONS. PART 1: THE GENERAL DISPERSION RELATION
V. Formisano and P. Salinari Oct. 1970 23 p refs
(LPS-70-5-pt-1) Avail: NTIS HC $3.25

Starting from a Vlasov-Maxwell system of equations, a correction to the linear theory of plasma waves is obtained. The results are valid for an infinite, homogeneous collisionless two component plasma immersed in an external uniform magnetic field. It is also assumed that the existing weak turbulence has an interaction time much longer than the gyroperiod. Author (ESRO)

N74-13475# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
LOW FREQUENCY PLASMA WAVES NON-LINEAR INTERACTIONS. PART 2: THE COLD PLASMA THEORY
V. Formisano, P. Salinari, and D. Bollea Oct. 1970 20 p refs
(LPS-70-5-pt-2) Avail: NTIS HC $3.00

A cold plasma theory was developed for three waves mode-mode nonlinear interactions. For very low frequencies it was found that processes involving three Alfven waves or three magnetosonic waves are forbidden. For the solar wind (C sub A = C sub S) only the Alfven + longitudinal waves interaction is relevant, the result being another Alfven wave. For magnetosphéric cases (C sub A greater than C sub S) the relevant interaction is the Alfven + magnetosonic process resulting in a longitudinal mode. Author (ESRO)

N74-13476# Florida Univ., Gainesville.
A STUDY OF ELECTRODELESS ARC DISCHARGE USING ARGON, NITROGEN, AND AIR Final Report, Jan. 1972 - Mar. 1973
Dennis R. Keefer Arnold AF Station, Tenn. AEDC Sep. 1973 48 p refs
(Contract F40600-72-C-0005)
(AD-767220; AEDC-TR-73-143) Avail: NTIS CSCL 20/9

A study of the bluff-body stabilized electrodeless arc was undertaken to extend the operation to greater mass flow rates and power input. A small arc chamber, operating at a frequency of 3.5 MHz, was operated with mass flows up to 1.026 gm/sec of argon at atmospheric pressure with a power input of 6.79 KW. Under these conditions a plasma bulk temperature of 2305K was obtained with a heating efficiency of 18%. It was found that heating efficiency increased with chamber pressure, but bulk temperature depends primarily upon the power input. A larger arc chamber was designed for a nominal power input of 200 KW at a frequency of 377 MHz. This chamber was operated at mass flow rates up to 2.4 gm/sec of argon at a pressure of two atmospheres. A plasma bulk temperature of 5856 K was obtained at a power input of 76 KW. Attempted operation using air as a working fluid was unsuccessful at pressures in excess of 2/3 atmosphere due to inefficient coupling to the arc plasma. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-13477 Catholic Univ. of America, Washington, D.C.
MAGNETIC PROPERTIES OF PARAMAGNETICALLY DOPED CRYSTALS Ph. D. Thesis
James Joseph Feeney 1973 119 p
Avail: Univ. Microfilms Order No. 73-21099

A paramagnetic ion in an insulating crystal is subject to the influence of its surrounding atoms and ions. This influence is, in many cases, purely electrical and depends on the symmetry and properties of the host crystal. Its effect on the ground state is often described by a set of crystal field parameters in an effective spin Hamiltonian formalism. In the literature, it is customary to find an empirical description of energy levels together with the crystal field parameters determined from them. The wave functions, transition probabilities and susceptibilities are rarely quoted. In this work the energy levels, wave functions, and transition

probabilities are calculated for a number of compounds whose crystal field parameters have been determined. A measurable variation in the magnetic properties of these compounds is calculated as a function of the crystal field parameters. A convergence criterion is introduced in the diagonalization of the Hamiltonian matrices dependent upon self consistency test on the eigenvectors. This assures numerically accurate wave functions. Dissert. Abstr.

N74-13478 British Library Lending Div., Boston Spa (England).
MECHANISM OF THE TRANSFER OF CURRENT IN THE CONTACT METAL-GALLIUM ARSENIDE
A. B. Vyatkin and N. K. Maksemova 23 Jul. 1973 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Fiz. (Tomsk), no. 1, 1971 p 82-87
(BLL-DRIC-Trans-2520-(3623.66)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The temperature relationship of the volt-ampere characteristics of surface-barrier junctions of metal n-type gallium arsenide with various levels of alloying was investigated. It is shown that the mechanism of the transfer of current is determined by the temperature and intensity of the electronic or thermoelectron -at which field emission takes place. Author

N74-13479 British Library Lending Div., Boston Spa (England).
NEGATIVE RESISTANCE CHARACTERISTICS AND SWITCHING CHARACTERISTICS IN GLASS SEMICONDUCTORS
K. Homma 30 Aug. 1973 6 p refs Transl. into ENGLISH from the Tokyo sect. of the Conv. Record of IEE (Japan), 1970 p 159-160
(BLL-CE-Trans-5735-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

The origin of the negative switching characteristic and switching of glass semiconductors is explained. On the basis of experimental work in which a filamentous high conductivity region was formed in the glass semiconductor and expanded towards the electrodes, the following model is proposed: the switching phenomenon and current-controlled negative resistance is caused by the expansion of a filamentous high conductivity region towards the electrodes, resulting in a short circuit between the electrodes. Experimental values and the theoretical values afforded by this model were compared, using a bulk sample of Te 70%, Ge 20%, Se 10%, and found to be in close agreement. Author

N74-13480 Yale Univ., New Haven, Conn.
A STUDY OF ADSORPTION ON SINGLE CRYSTAL METAL OXIDES AND THIN METAL FILMS USING ATTENUATED TOTAL REFLECTION INFRARED SPECTROSCOPY Ph.D. Thesis
Richard Wayne Rice 1972 251 p
Avail: Univ. Microfilms Order No. 73-21031

The feasibility of applying internal reflection spectroscopy (IRS) to study adsorption of gases on solid surfaces is studied. This was accomplished by means of an extensive experimental investigation of adsorption on two widely different types of surface: (1) single crystal oxides and (2) extremely small, highly dispersed metal particles. The experimental findings confirmed that IRS provides an attractive alternative to standard infrared techniques for studies of adsorption on metals, and that, unlike infrared methods employed heretofore, IRS is suitable for investigations involving low area samples with relatively well defined surfaces. Dissert. Abstr.

N74-13481 Rice Univ., Houston, Tex.
MAGNETOSTRICTIVE GENERATION OF ULTRASONIC WAVES IN TERBIUM SINGLE CRYSTALS Ph.D. Thesis
Carey Hamilton Snyder, Jr. 1973 134 p
Avail: Univ. Microfilms Order No. 73-21598

Generation of 5 MHz ultrasonic waves in single crystals of terbium was observed between 110K and room temperature. Between 190K and 240K the ultrasonic generation was strong and increased montonically with increasing field. Above 240K the generation was weak; below 190K, the echo pattern varied in a complicated manner with field. An equation of motion approach involving angular momentum operators up to second order, formed from Hermetian linear combinations of the irreducible tensor operators, was developed to explain the observations. The equation of motion approach was further applied to a consideration of magnetoacoustic birefringence at 30 MHz in terbium. Phenomenological relaxation times were included in the equations of motion. Dissert. Abstr.

N74-13482# New South Wales Univ., Kensington (Australia). School of Physics.
STUDY OF SEMICONDUCTOR SURFACES BY ELECTRON PARAMAGNETIC RESONANCE M.S. Thesis
John Higinbotham Nov. 1971 196 p refs
Avail: NTIS HC $12.00

Extensive ESR measurements on the surface of Ge in UHV have been made in the temperature range 77 K to 670 K and a resonance was observed at 77 K with g = 2.02 + or - 0.01 and width 3 + or - 1 mT. The observed spin density was only 5 x 10 to the 12th power spins sq cm but this represents a lower limit since the resonance was heavily saturated at the microwave power used. The actual spin density was estimated to be 2 x 10 to the 13th power spins sq cm. These paramagnetic surface states have approximately one tenth the density observed for Si. Oxygen was adsorbed onto the clean surface at low temperatures creating a paramagnetic species which was destroyed by heating above approximately 200 K. Using an improved crushing technique the clean surface of Si was studied and with exposures as low as 1 x 10 to the - 8th power Torr-min the reported g = 2.0055 resonance was observed indicating its clean surface origin. Author

N74-13483# Research Inst. of National Defence, Stockholm (Sweden).
THE PRESENT SITUATION AND FORECASTS OF SEMICONDUCTOR ELEMENTS PERFORMANCE WITHIN THE MICROWAVE RANGE, 1970 - 1985 [NULAEGE OCH PROGNOS FOER FT ELEMENTS PRESTANDA INOM MIKROVAGSOMRADET 1970 - 1985]
Bertil Peterson Sep. 1971 224 p refs In SWEDISH
(FOA-3-A-3751-E8) Avail: NTIS HC $13.25

The present situation and possible developments over the period 1970-1985 for active semiconductor elements in the microwave range are outlined. After a short historical survey of FT techniques, the following are discussed: Generation, power amplification, amplification of small signals, frequency conversion, detection, electronic signal control and integrated microwave circuits. Author

N74-13484# California Univ., Los Angeles. Dept. of Materials.
DIFFRACTION CONTRAST EFFECTS AT EXTRINSIC GRAIN-BOUNDARY DISLOCATIONS
R. C. McDonald and A. J. Ardell Feb. 1973 26 p refs
(Contract AT(04-3)-34)
(UCLA-34-P-177-14) Avail: NTIS HC $3.50

Extrinsic grain-boundary dislocations (GBDs) in Types 304 and 316 austentic stainless steels, introduced by plastic deformation, were studied by transmission electron microscopy. The disappearance of contrast under certain diffracting conditions was investigated, from which it was concluded that the displacement vector of the GBD is not necessarily unique. Instead, two vectors are required to characterize the displacements in the crystals on either side of the grain boundary. A series of systematic contrast experiments were also performed to determine the conditions for reversal of GBD contrast. It was established that the image of the GBD reverses from black to white, and vice versa, whenever the grain boundary in which it lies is the lower surface of the strongly diffracting grain. If the grain boundary is the upper surface of the strongly diffracting grain, contrast reversal does not occur. This rule applies when one of the two grains on either side of an inclined grain boundary is oriented for two-beam diffracting conditions. Author (NSA)

N74-13485# Oak Ridge National Lab., Tenn.
IMAGE CONTRAST OF DISLOCATION LOOPS IN bcc METALS
S. M. Ohr 1972 7 p refs Presented at the Conf. on Defects and Defect Clusters in bcc Metals and their Alloys, Gaithersburg, Md., 14 Aug. 1973 Sponsored by AEC

(Conf-730813-3) Avail: NTIS HC $3.00

Electron-microscope image contrast for small dislocation loops in niobium was calculated from the dynamical theory of electron diffraction using displacement field corresponding to both prismatic and shear components of the Burgers vector. For dynamical diffraction conditions, in addition to the usual black-white contrast, some loops whow a triple white-black-white or a black-white-black contrast, depending on the depth and the orientation of the loop. Results indicate that care should be taken in determining the vacancy or interstitial nature of dislocation loops in irradiated bcc metals. Author (NSA)

N74-13486# Louisiana State Univ., Baton Rouge. Dept. of Physics.

CONDUCTIVITY TENSORS IN METALS AND SEMICONDUCTORS Final Report

J. M. Reynolds 1972 14 p refs

(Contract AT(40-1)-3087)

(ORO-3087-51) Avail: NTIS HC $3.00

Work completed is listed by the year for each of nine years. The particular transport effects studied are listed by the effect and by the material. The Fermi surface studies are given by the technique. The Knight shift measurements are mentioned. The graduate students, publications, and papers presented at meetings are listed. NSA

N74-13487# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.

INTRODUCTION OF DISLOCATIONS AND SLIP BANDS IN MOLYBDENUM SINGLE CRYSTALS

S. S. Lau and T. Vreeland, Jr. 1972 12 p refs

(Contract AT(04-3)-767)

(CALT-767-P-3-34) Avail: NTIS HC $3.00

The characteristics of selectively introduced slip bands and individual dislocations were investigated. It was found that slip bands produced by indenting the (112) surface had three types of Burgers' vectors concentrated at the two edges of the slip band while the middile of the slip band consisted of primarily the plus or minus 1/2 (111) Burger's vector. Scratching the specimens with a needle almost parallel to the (112) surface in the (111) direction produced individual screw dislocations near the scratch mark. Similar scratches normal to the (111) direction produced fine slip bands with a plus or minus 1/2 (111) Burger's vector. Author (NSA)

N74-13488# Brookhaven National Lab., Upton, N.Y.

ADSORBED HELIUM FILM: TWO DIMENSIONALITY VERSUS REALITY

A. D. Novaco 1973 10 p refs Presented at Symp. on Monolayer and Submonolayer Helium Films, Hoboken, N. J., 7 Jun. 1973 Sponsored by AEC

(BNL-17948; Conf-730635-1) Avail: NTIS HC $3.00

The two dimensional nature of helium absorption on graphite substrates is discussed in terms of the essential ingredients in a first-principle calculation for explaining the experimental data relating to the ground state of the solid phase, and lattice dynamics. It is concluded that the narrow width of the phonon spectrum is a measure of the coupling between the amplitude on in-plane and normal-to-the-plane zero-point motion. F.O.S.

N74-13489# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

MICROSTRUCTURE OF ION-BOMBARDED SINGLE CRYSTAL MOLYBDENUM

J. L. Brimhall and E. P. Simonen 1973 11 p refs Presented at Conf. on Defects and Defect Clusters in bcc Metals and their Alloys, Gaithersburg, Md., 14 Aug. 1973 Sponsored by AEC (BNWL-SA-4727; Conf-730813-5) Avail: NTIS HC $3.00

The microstructure produced by bombardment with 7.5-MeV Ta(3+) ions was studied in zone-refined single crystals of molybdenum at a bombardment temperature of approximately 900 C. Results on polycrystalline molybdenum are also presented. The void concentration reaches a maximum at a relatively low ion dose and further volume changes occur solely by void growth. The resultant void volume swelling shows a less than linear dependence on dose. No indication of swelling saturation is present up to a total dose of 150 dpa. The trend in the data is at least consistent with the approximate swelling formula of Brailsford and Bullough (J. Nucl. Mat., 44: 121 (1972)). The void lattice is well established at a relatively low dose of 10 dpa and increasing dose only produces increased perfection of the lattice. The lattice spacing does not vary with dose. An explanation for the void lattice based on an anisotropy of the vacancy concentration field is suggested. Author (NSA)

N74-13490# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

THE CONDUCTIVITY OF QUARTZ AFTER ELECTROLYSIS

Richard N. Brown 31 Jul. 1973 10 p refs

(AF Proj. 5620)

(AD-767593; AFCRL-TR-73-0479; AFCRL-PSRP-556) Avail: NTIS CSCL 20/12

The author discusses the conductivity of crystalline alpha-quartz before and after electrolysis, as well as the processes occurring during electrolysis. It has been shown that the value of the conductivity can be used to indicate the progress of the treatment. Author (GRA)

N74-13491# Martin Marietta Corp., Baltimore, Md.

SURFACE CHARGE-DEPENDENT MECHANICAL BEHAVIOR OF NON-METALS

N. H. MacMillan and A. R. C. Westwood Sep. 1973 38 p refs

(Contract N00014-70-C-0330)

(AD-767068; MML-TR-73-13C; TR-8) Avail: NTIS CSCL 07/2

When an inorganic nonmetallic solid is immersed in a non-corrosion, surface-active liquid environment, the mobility of near-surface dislocations and/or microhardness is markedly influenced by the surface charge developed on the solid. Specifically, it appears that such solids are hardest at their iso-electric points (as determined from zeta-potential measurements). This paper presents some examples of such behavior, considers possible mechanisms, and discusses how such chemomechanical effects can be employed to control the machining and frictional behavior of ceramics and glasses.

Author (GRA)

N74-13492# Rockwell International Corp., Anaheim, Calif. Electronics Group.

FUNDAMENTAL STUDIES OF SEMICONDUCTOR HETEROEPITAXY, PART 2 Final Report, Jun. 1970 - 30 Jun. 1973

Ralph P. Ruth, A. James Hughes, Joseph L. Kenty, Harold M. Manasevit, and Arthur C. Thorsen Aug. 1973 220 p refs

(Contract DAAH01-70-C-1311; ARPA Order 1585)

(AD-767288; C71-86/501-Pt-2) Avail: NTIS CSCL 09/1

Contents; studies of in situ film growth in the electron microscope; electrical properties of heteroepitaxial films; anisotropy in electrical properties of Si films on Al2O3; miscellaneous structural evaluations of heteoroepitaxial semiconductor films; and design and fabrication of special devices.

Author GRA

N74-13493# Maryland Univ., College Park. Engineering Materials Group.

THE STRENGTHENING, OR WEAKENING, OF POLYCRYSTALS DUE TO THE PRESENCE OF GRAIN BOUNDARIES

Ronald W. Armstrong Aug. 1973 72 p refs

(Contract N00014-67-A-0239-0011; NR Proj. 031-739)

(AD-767390; EMG-132; TR-11) Avail: NTIS CSCL 11/6

The grain boundaries which are present within a polycrystalline aggregate frequently contribute to strengthening the material because they provide a definite resistance to slip bands or twin bands that otherwise would propagate freely through the microstructure. Experimental and theoretical analyses which bear on this general subject are reviewed in this report. Particular attention is given to the following items: The application of the Hall-Petch relation to a variety of microstructures and to providing an assessment of the complete stress-strain behavior; The experimental and theoretical application of the stress-grain size analysis to specifying the brittle fracture stress, even for pre-cracked specimens, and to describing the ductile-brittle transition behavior of various materials; and, The dependence on grain size of the hardness, creep, and fatigue properties of several metals and alloys, especially, as these properties are

related to the conventional stress-strain behavior of these same materials. (Modified author abstract) GRA

N74-13494# Alabama Univ., University.
THE DETERMINATION OF SEMICONDUCTOR JUNCTION VULNERABILITY TO SECOND BREAKDOWN BY LOW ENERGY ELECTRICAL MEASUREMENTS Final Report, 12 Apr. 1972 - 15 Jun. 1973
Wilford D. Raburn, Wayne H. Causey, Edward C. Friday, and Hamish H. Wong 30 Jul. 1973 96 p refs
(Contract DAAH01-72-C-0734)
(AD-767365; BER-155-93) Avail: NTIS CSCL 09/1

The possibility of correlations between second breakdown energy characteristics and low level junction parameters for diodes was investigated. The low level parameters considered were ac resistance in the first breakdown region, reverse current, first breakdown voltage, breakdown voltage of the first microplasma region, and the resistivity of the high resistivity side of the junction. The diodes studied consisted of the collector-base junctions of the 2N2222, 2N2862, and 2N3304 bipolar transistors. No correlations between low level electrical measurements and second breakdown energy evaluated for a 1 millisecond pulse width were observed for any group of devices or for any comparison between device types. Author (GRA)

N74-13495# Monsanto Research Corp., St. Louis, Mo.
MAGNETIC BUBBLE MATERIALS Final Report, 11 Jan. - 11 Jul. 1973
Jerry W. Moody, Robert M. Sandfort, Roger W. Shaw, Michael C. Willson, and Joseph T. Cheng 11 Aug. 1973 65 p refs
(Contract DAAH01-72-C-1098; ARPA Order 1999)
(AD-767299; MRC-SL-386) Avail: NTIS CSCL 20/2

The Czochralski growth of defect-free, non-magnetic garnet crystals and the preparation of epitaxial magnetic bubble garnet films by liquid phase epitaxy (LPE) and arc-plasma spraying (APS) were investigated. Two garnet systems, Eu-Yb-Y and Sm-Y, were identified as being of particular practical interest. These garnets exhibit reasonable mobilities, satisfactory quality factors, and good temperature stability. Device-quality films can be deposited by LPE from PbO-B2O3 solution on (111) GGG substrates. Methods were developed for growing epitaxial garnet films by APS. However, the films were usually contaminated with crystallites of orthoferrite, hematite, magnetoplumbite or other phases. Low defect density films were not prepared and the elimination of unwanted phases by compositional control appears to be a formidable problem. All recent developments indicate that the LPE dipping growth of garnet films is a commercially viable process. Core free single crystals of GGG with defect densities of less than 5 per sq cm can be grown readily by the Czochralski method. Such crystals, up to 38 mm in diameter, are now available commercially. Author (GRA)

N74-13496# Pennsylvania State Univ., University Park. Materials Research Lab.
MATERIALS PREPARATION AND CHARACTERIZATION Annual Technical Progress Report, 1 Jul. 1972 - 30 Jun. 1973
Aug. 1973 180 p refs
(Contract DA-49-083-OSA-3140; NSF GH-34547)
(AD-767301) Avail: NTIS CSCL 20/12

The report summarizes research conducted of the Materials Research Laboratory of Pennsylvania State University on various materials. GRA

N74-13497# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
IR WINDOW STUDIES Quarterly Report
Ferdinand Kroger and John H. Marburger 15 Mar. 1973 63 p refs
(Contract F19628-72-C-0275; ARPA Order 2055)
(AD-767316; USCEE-454; AFCRL-TR-73-0054; QTR-3) Avail: NTIS CSCL 20/5

During this quarter, additional wavelength dependent calorimetric measurements of IR absorption in very pure GaAs have been made which indicate that a lower level of absorption coefficient is being reached for GaAs grown from the high temperature melt by conventional techniques. Experiments on strain annealing and purification of GaAs have been carried out in an effort to modify its absorption characteristics. The stress-strain properties of GaAs are under continuing investigation. The ultra pure Alkali Halide production facility is now in operation and producing KCl powder as well as single crystals. A new technique for measuring surface absorption has been devised, and preliminary feasibility experiments completed. An important class of sum rules for the frequency moments of the multiphonon contribution to absorption coefficients has been discovered. Progress in other areas of IR window material preparation, characterization and growth is reported.
Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-13498# Research Inst. of National Defence, Stockholm (Sweden).
ACCELERATION STRESSES IN THE PROPELLENT CHARGES OF PROJECTILE GUNPOWDER [ACCELERATIONSSPAENNINGAR I PROJEKTILBURET AKETKRUT]
Rene Renstroem Feb. 1972 29 p refs In SWEDISH
(FOA-2-C-2525-D3) Avail: NTIS HC $3.50

The propellent charges in auxiliary engines for gun projectiles are exposed to considerable mechanical stresses during acceleration through the gun barrel. Calculations are given for these stresses in a casing of a straight circular cylindrical shape which is compressed by acceleration along a symmetrical axis. The material is assumed to be of an arbitrary linear viscoelastic type. The influence of viscosity on the distribution of stress in the body is studied in detail. Comparisons are made between the ways stresses are caused by different acceleration functions. The results are further discussed with respect to actual operating conditions. Special attention is given to the effect of the main firing charge on the build up of stress. If this charge is of high level for a short time then the tensions and dimensions referred to can arise. Author

N74-13499# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
CONCENTRATION DISTRIBUTION OF SURFACE AGENTS IN PROPELLANT POWDERS [KONZENTRATIONSVERTEILUNG VON OBERFLAECHENBEHANDLUNGSMITTELN IN TREIBLADUNGSPULVERN]
F. Volk 8 May 1973 57 p refs In GERMAN
(ICT-1/73) Avail: NTIS HC $5.00

The distribution of surface agents in powder particles was investigated. Microtomic slices of the model powders and gun propellant powders used were extracted with dichloromethane, and the amounts of camphor, diethyl phthalate or ethyl centralite were determined by gas chromatography. The influence of thermal loading was established: the diffusion of the plasticizers is strongly dependent on the residual solvent content of the powders.
ESRO

N74-13500# Explosives Research and Development Establishment, Waltham Abbey (England).
THE RAPID DETERMINATION OF VOLATILE MATTER BY THE MYTRON FAB-1 MOISTURE METER
R. J. J. Simkins and Jean Squire Mar. 1973 50 p
(ERDE-TN-82; BR36665) Avail: NTIS HC $4.50

The use of a Mytron FAB-1 moisture tester for the determination of the volatile matter content of propellant ingredients was investigated and compared with other conventional volatile mater determinattions. The instrument was found to be suitable for nitrocellulose and for cordite pastes, and could be used for polyvinyl nitrate and sodium stannate. Although inherently less accurate, the Mytron gave better precision than conventional methods. Considerable savings in time were possible. Author (ESRO)

N74-13501# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

JP-4 THERMAL STABILITY SURVEY Final Report, Jun. 1971 - Aug. 1972
Jerry C. Ford, Royce P. Bradley, and Leonard C. Angello Jun. 1973 35 p refs
(AF Proj. 3048)
(AD-767591; AFAPL-TR-73-27) Avail: NTIS CSCL 21/4

A survey was conducted to determine the thermal stabilities of JP-4 fuels produced by refineries in the United States. The effect on fuel availability of increasing the test conditions of the JP-4 specification from 300/400F to 325/425F was determined to be minimal provided a precise method of measuring thermal stability is available. Physical properties on the 19 JP-4 fuels are documented. (Modified author abstract) GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-13502* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERSONIC-COMBUSTION ROCKET Patent
Richard J. Weber and Leo C. Franciscus, inventors (to NASA) Issued 11 Dec. 1973 5 p Filed 10 Mar. 1972 Supersedes N72-20769 (10 - 11, p 1520)
(NASA-Case-LEW-11058-1; US-Patent-3,777,490; US-Patent-Appl-SN-233519; US-Patent-Class-60-258; US-Patent-Class-60-259) Avail: US Patent Office CSCL 21H

A supersonic combustion rocket is provided in which a small rocket motor is substituted for heavy turbo pumps in a conventional rocket engine. The substitution results in a substantial reduction in rocket engine weight. The flame emanating from the small rocket motor can act to ignite non-hypergolic fuels.
Official Gazette of the U.S. Patent Office

N74-13503*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
HOLLOW CATHODE RESTARTABLE 15 CM DIAMETER ION THRUSTER Annual Report, 1 Dec. 1972 - 1 Dec. 1973
Paul J. Wilbur Dec. 1973 101 p refs
(Contract NGR-06-002-112)
(NASA-CR-134532) Avail: NTIS HC $7.25 CSCL 21C

The effects of substituting high perveance dished grids for low perveance flat ones on performance variables and plasma properties within a 15 cm modified SERT II thruster are discussed. Results suggest good performance may be achieved as an ion thruster is throttled if the screen grid transparency is decreased with propellant flow rate. Thruster startup tests, which employ a pulsed high voltage tickler electrode between the keeper and the cathode to initiate the discharge, are described. High startup reliability at cathode tip temperatures of about 500 C without excessive component wear over 2000 startup cycles is demonstrated. Testing of a single cusp magnetic field concept of discharge plasma containment is discussed. A theory which explains the observed behavior of the device is presented and proposed thruster modifications and future testing plans are discussed. Author

N74-13504*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PERFORMANCE ANALYSIS OF THE ASCENT PROPULSION SYSTEM OF THE APOLLO SPACECRAFT
John C. Hooper, III Washington Dec. 1973 43 p refs
(NASA-TN-D-7400; JSC-S-354) Avail: NTIS HC $4.25 CSCL 21H

Activities involved in the performance analysis of the Apollo lunar module ascent propulsion system are discussed. A description of the ascent propulsion system, including hardware, instrumentation, and system characteristics, is included. The methods used to predict the inflight performance and to establish performance uncertainties of the ascent propulsion system are discussed. The techniques of processing the telemetered flight data and performing postflight performance reconstruction to determine actual inflight performance are discussed. Problems that have been encountered and results from the analysis of the ascent propulsion system performance during the Apollo 9, 10, and 11 missions are presented. Author

N74-13505# Aerospace Corp., El Segundo, Calif.
BASE FLOW ANALYSIS FOR A DUAL-ENGINE BOOSTER
Yong S. Hong 16 Jul. 1973 73 p refs Backup document for AIAA Synoptic, "Base Flow Analysis of Multiple-Engine Boosters', scheduled for publication in Journal of Spacecraft and Rockets in Apr. 1974
(Contract F04701-72-C-0073)
(TR-0074(4901-01)-1) Avail: NTIS HC $5.75

A method of predicting the base pressure and the base gas temperature of a multi-engine booster was developed based on Korst's integral theory. The outer base region where the freestream-exhaust jets interaction takes place is analyzed by treating the outer boundary of the multi-jet exhaust plumes as an equivalent single-engine configuration so that the existing single-engine analysis method can be applied readily. Mass and energy transfer from the inner base region is calculated from the exhaust jet interaction analysis which includes the initial boundary layer. Solution is obtained from the net exchange of mass and energy between the outer and the inner base regions. The predicted results were compared with flight data from the two-engine configuration Titan 3 B booster as well as with some available wind tunnel data on the four-engine configuration.
Author

N74-13506*# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
THE STARTING TRANSIENT OF SOLID PROPELLANT ROCKET MOTORS WITH HIGH INTERNAL GAS VELOCITIES Ph.D. Thesis
Arie Peretz, L. H. Caveny, K. K. Kuo, and M. Summerfield Apr. 1973 217 p refs
(Grant NGL-31-001-109)
(NASA-CR-136274; AMS-1100; AMS-1100-T) Avail: NTIS HC $13.00 CSCL 21H

A comprehensive analytical model which considers time and space development of the flow field in solid propellant rocket motors with high volumetric loading density is described. The gas dynamics in the motor chamber is governed by a set of hyperbolic partial differential equations, that are coupled with the ignition and flame spreading events, and with the axial variation of mass addition. The flame spreading rate is calculated by successive heating-to-ignition along the propellant surface. Experimental diagnostic studies have been performed with a rectangular window motor (50 cm grain length, 5 cm burning perimeter and 1 cm hydraulic port diameter), using a controllable head-end gaseous igniter. Tests were conducted with AP composite propellant at port-to-throat area ratios of 2.0, 1.5, 1.2, and 1.06, and head-end pressures from 35 to 70 atm. Calculated pressure transients and flame spreading rates are in very good agreement with those measured in the experimental system. Author

N74-13507*# General Electric Co., Philadelphia, Pa.
ON THE DESIGN AND TEST OF A LIQUID INJECTION ELECTRIC THRUSTER Final Report
Theodore A. Jones, John T. Kenny, and E. Howard Youmans 30 Jul. 1973 153 p ref
(Contract NAS1-11382)
(NASA-CR-132316) Avail: NTIS HC $9.75 CSCL 21C

The engine design and test program are reported for a liquid injection electric thruster. Results indicated thruster performance levels in excess of design goals. Thruster characteristics demonstrated included thrust output of over 4440 micronewtons (1000 micropounds (mu lbf) at 5Hz), impulse bits greater than 3000 micronewton sconds/pulse (675 mu lbf - seconds/pulse), and impulse bit to energy ratios in excess of 300 mu newton-second per joule (67.5 mu 1bf - seconds/watt). Supporting activities to the engine design and test included a five million pulse life test on the main capacitor, a 46 million pulse test on the trigger electronics, design and fabrication of a zero resistance torque connector for use with the tortional pendulum thrust stand, design and fabrication of a logic box for control of engine firing,

and a physical and chemical properties characterization of the perfluorocarbon propellant. Conclusions and recommendations are included. Author

N74-13508# Research Inst. of National Defence, Sundbyberg (Sweden).
REPORT ON A VISIT TO THE CONFERENCE ON LIFE SPAN OF ROCKET PROPULSION ASSEMBLIES, PROPELLANT- AND EXPLOSIVE-CHARGES [RESERAPPORT FRAN KONFERNS OM "LEBENSDAUER VON RAKETENTREIB-SAETZEN, TREIB- UND SPRENGLADUNGEN" 1 KARLSRUHE SEPTEMBER - OKTOBER 1971]
Jan Hansson Dec. 1971 35 p refs In SWEDISH Conf. held at Karlsruhe, West Germany, Sep.-Oct. 1971
(FOA-1-C-1434-D1) Avail: NTIS HC $3.75

A review of the conference is given together with a short reference to the lectures, a list of those attending with their connections and information on the arranging institution's organizations and ranges of activity. The important item of the conference was rocket fuel, with interesting contributions on differential thermal measurements and Dutch calorimeter methods. The explosive element was dealt with briefly and the only pyrotechnical lecture was based on Swedish material. The conference clearly revealed the delay in development and the need of increased contributions, not least with respect to the economic benefit which could be achieved with greater knowledge on the subject of the problem. Author

N74-13509# Research Inst. of National Defence, Sundbyberg (Sweden).
CALCULATION OF THE BREAKDOWN PROCESS IN AN HYDROGEN PEROXIDE CONTAINER [BERAKNING AN SONDERFAUSFORLOPP I VATEPEROXIDBEHALLARE]
Ivar Lill Dec. 1971 44 p In SWEDISH
(FOA-1-C-1435-D3/F5) Avail: NTIS HC $4.25

An estimation of thermal conditions in connection with the storage of hydrogen peroxide has been carried out based on data available in current literature. The unstabilized from shows a comparatively favourable process, in the case of stabilized hydrogen peroxide, at least 10 times better safety conditions are obtained. Author

N74-13510# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
A NUMERICAL SOLUTION FOR THE HEAT TRANSFER BETWEEN AN AXI-SYMMETRIC AIR JET AND A HEATED PLATE
R. Ravuri and W. Tabakoff Sep. 1973 36 p refs
(Contract DAHC04-69-C-0016)
(AD-767266; AROD-T-4-57-E; Rept-73-38) Avail: NTIS CSCL 21/5

Due to their characteristic high rate of heat transfer, impinging air jets are being used extensively in industry. A numerical scheme is devised to predict the heat transfer between an axi-symmetric air jet and a heated plate, neglecting the effect of curvature, compressibility, and turbulence. The momentum and continuity equations are transformed to vorticity and stream function equations and are then solved by iterative successive substitution techniques to determine the flow field and subsequently the temperature distribution in the fluid. An attempt is made to predict the average heat transfer coefficient of a row of axi-symmetric air jets impinging on a heated plate by assuming that each jet cools a fraction of the plate without any interference from the neighboring jets. Author (GRA)

N74-13511# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL INVESTIGATION OF THE EFFECTS OF TIP CLEARANCE AND END LOSSES ON AXIAL COMPRESSOR PERFORMANCE M.S. Thesis
John Kirtland Welch Jun. 1973 136 p refs
(AD-767656) Avail: NTIS CSCL 21/5

The objective of the study was to determine by experimental means the rotor efficiencies at different radii between hub and tip of a single stage axial compressor at its design point, to show the influence of tip clearance and end losses. Procedures for calibration and application of pressure probes to survey the flow in the compressor were established and programs were written to analyze the measured data. Recommendations are made for improvements of the data reduction method, which should precede experiments involving controlled changes in the blade tip clearances. Author (GRA)

N74-13512# TRW Systems Group, Redondo Beach, Calif.
ANNULAR COLLOID THRUSTER FOR THREE-AXIS STABILIZED MILITARY SATELLITES Technical Report, 15 Nov. 1971 - 1 Apr. 1973
Marshall N. Huberman Jun. 1973 135 p refs
(Contract F04611-72-C-0018)
(AD-767601; AFRPL-TR-73-39) Avail: NTIS CSCL 21/3

The report describes a program to increase the performance capability of high thrust density colloid thrusters. Single emitter sources have been developed which produce greater than 25 micro lbs thrust at 75 percent efficiency and 1300 seconds specific impulse as measured by time-of-flight techniques. Multi-source modules were also built and successfully tested in the 100 micro lbs range for periods of the order of 100 hours. The ability to maintain constant performance within plus or minus 3 percent was also demonstrated. Beam probe measurements indicated that 90 percent of the propellant exhaust was contained with a 15 degree half angle. Lithium iodide and potassium iodide doped glycerol solutions were briefly looked at as candidate propellants with no performance improvements observed. Also the ability of an antistatic additive to induce electrical conductivity in a low vapor pressure pump oil was investigated with negative results. New evaporation rate measurements made with pure glycerol showed that the sodium iodide/glycerol evaporation rate was 40 percent below that of pure glycerol. Furthermore the measured results showed that the evaporated mass loss at typical operating temperatures would be of the order of one percent of the nominal thruster operating mass flow. (Modified author abstract) GRA

N74-13513# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
OFF-DESIGN BEHAVIOR FOR AXIAL FLOW COMPRESSOR STAGES WITH INVARIABLE AND VARIABLE GEOMETRY BLADES
K. Grahl and W. Tabakoff Sep. 1973 68 p refs
(Grant DA-ARO(D)-31-124-G154)
(AD-767265; AROD-10223-6-E) Avail: NTIS CSCL 21/5

An application of a computer program is described for studying the off-design performance for single and multistage axial flow compressors. The calculation method allows one to determine the stage characteristics as a function of revolutions. This can be accomplished in a very short time with only a few geometrical and aerodynamical input data. The flow is described by the well-known streamline curvature method. The necessity of a good loss model is shown. Limitations of this method are described. Some computation examples for the first and fifth stages of a ten-stage NASA axial flow compressor are presented. The stage and overall characteristics for different compressors are considered for invariable and variable blade geometry. The off-design analytical results are compared with existing experimental results. Author (GRA)

N74-13514# United Aircraft Corp., East Hartford, Conn.
DEVELOPMENT OF OPTIMAL CONTROL MODES FOR ADVANCED TECHNOLOGY PROPULSION SYSTEMS Interim Technical Report, 1 Feb. - 30 Jun. 1973
Gerald J. Michael and Florence A. Farrar Aug. 1973 37 p refs
(Contract N00014-73-C-0281; NR Proj. 215-219)
(AD-767425; UARL-M911620-1) Avail: NTIS CSCL 21/5

A nonlinear multivariable feedback controller was developed for the V/STOL hover application (80 to 100 percent thrust range) of the Pratt and Whitney Aircraft F401 variable cycle turbofan engine. The analytical design involved (1) linearizing the F401 engine dynamics about two closely-spaced, steady-state operating points and applying linear optimization methods at each point, and (2) combining two optimal linear controllers into a single nonlinear controller having feedback gains that vary with system state. Variable fan, compressor, and exhaust geometries and changes in main burner fuel flow rate are coordinated by the controller to achieve improved engine dynamic response. Responses with the optimal controller were computed using a nonlinear digital simulation of the engine.

The engine response evaluated was for a commanded thrust change from the V/STOL hover setting (80 percent) to military rated thrust (100 percent). These responses were compared with those obtained using a state-of-the-art conventional controller designed to provide rapid thrust response (the P and WA) fast accel controller). (Modified author abstract) GRA

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-13515 Arizona Univ., Tucson.
A PRECISE MEASUREMENT OF THE SUN'S VISUAL OBLATENESS Ph.D. Thesis
Paul Douglas Clayton 1973 145 p
Avail: Univ. Microfilms Order No. 73-20644

The question of solar oblateness in relationship to the experimental verification of gravitational theories is discussed. The observed perihelion precession of Mercury is presently the only test of sufficient accuracy to verify Einstein's General Theory of Relativity. The agreement between theory and observation in this instance implicitly assumes that the sun does not have a gravitational quadrupole moment. If there is no visual solar oblateness, it is difficult to conceive that a gravitational quadrupole could exist. On the other hand a visual oblateness would not indicate unequivocally that a quadrupole moment exists; one must still ascertain that the visual edge definition was not influenced by latitude dependent variations in the solar limb intensity profile and gain additional understanding about the relationship between the solar photosphere and the gravitational equipotential surface. Dissert. Abstr.

N74-13516 Rice Univ., Houston, Tex.
ACCELERATION AND INJECTION OF SOLAR-WIND PARTICLES AT THE MAGNETOPAUSE Ph.D. Thesis
Thomas Westfall Hill 1973 126 p
Avail: Univ. Microfilms Order No. 73-21559

The earth's magnetopause is modeled as a tangential boundary between two regions of plasma having either parallel or antiparallel magnetic fields. The boundary has the geometry of a tangential discontinuity, but has a finite dimension in the direction of current flow. In a steady state, the loss of current-carrying particles from the boundary requires a flow of plasma into the boundary. The properties of this plasma flow are derived from the conditions of mass momentum, and energy conservation. When the fields on either side are parallel, plasma flows through the boundary toward the region having the smaller ratio of (plasma concentration)/field strength). When the fields are antiparallel, plasma flows toward the boundary from both sides. As applied to the magnetopause, the tangential-boundary model provides a mechanism for acceleration and injection of solar wind particles into the magnetosphere to populate the plasma sheet when the interplanetary magnetic field is northward. Dissert. Abstr.

N74-13517 Catholic Univ. of America, Washington, D.C.
SOLAR X-RAY SPECTRA OF CORONAL ACTIVE REGIONS Ph.D. Thesis
John Fred Meekins 1973 225 p
Avail: Univ. Microfilms Order No. 73-21740

A rocket instrument consisting of three Bragg crystal spectrometers is described. Crystal reflectivities and detector efficiencies were determined for this instrument and used to define the solar X-ray spectrum from 1A to 25A obtained on March 2, 1972, from coronal active regions. A differential emission measure is presented for the entire solar emission in this wavelength range as a function of temperature. Using this differential emission measure, the measured line emission is compared with line emission predicted by Maxwellian electron velocity distributions. The predicted line emission compares very well with experiment implying that, in the examined coronal active regions, the electron velocity distribution is Maxwellian. Dissert. Abstr.

N74-13518 Rice Univ., Houston, Tex.
LOW ENERGY GAMMA RADIATION FROM THE GALACTIC-CENTER REGION Ph.D. Thesis
Wiley Neil Johnson 1973 187 p
Avail: Univ. Microfilms Order No. 73-21564

Observations of the Galactic Center in the low-energy gamma-ray region of the electromagnetic spectrum have been performed using a balloon-borne gamma-ray telescope. An experiment was sensitive to gamma rays in the energy range 0.02 MeV to approximately 1.0 MeV and detected a continuum radiation up to approximately 0.40 MeV attributable to the Galactic-Center region. A feature consistent with a gamma-ray emission line at approximately 0.5 MeV was also observed in the spectrum from the Galactic Center. Since gamma-ray lines are a direct observational link between nuclear physics and astrophysics, this first detection of a gamma-ray spectral line from a celestial source has many astrophysical and cosmological implications. Dissert. Abstr.

N74-13519 British Library Lending Div., Boston Spa (England).
THE VELOCITY FIELD IN THE SOLAR ACTIVE REGIONS
S. I. Gopasyuk Oct. 1973 10 p refs Transl. into ENGLISH from Izv. Krymsk. Astrofiz. Observ. (Moscow), v. 45, 1972 p 14-19
(BLL-RTS-8351) Avail: British Library Lending Div., Boston spa, Engl.: £0.90 or 3 BLL photocopy coupons

The velocity fields at the different levels of active solar regions were measured with a double magnetograph. Good correlation of the radial velocity records is found between velocities at adjacent levels. The correlation decreases with distance between the levels of line formation and disappears for the velocities recorded in the higher lines. The mean velocities which are averaged over the whole area increase with height exponentially. The mean velocities in the active and quiescent regions are approximately the same. The tangential velocities in the active regions are higher than the vertical ones. Author

N74-13520 British Library Lending Div., Boston Spa (England).
LARGE-SCALE VELOCITY FIELDS, MAGNETIC FIELDS AND BRIGHTNESS IN THE SOLAR ATMOSPHERE
S. I. Gopasyuk and T. T. Tsap Sep. 1973 18 p refs Transl. into ENGLISH from Izv. Krymk. Astrofiz. Observ. (Moscow), v. 45, 1972 p 3-13
(BLL-RTS-8350) Avail: British Library Lending Div., Boston Spa, Engl.: £1.70 or 6 BLL photocopy coupons

A correlation is studied between the radial velocities, magnetic fields, and brightness in active and quiescent regions on the sun. The records of magnetic fields, radial velocities, and brightness were made in the lambda 5250 A Fe 1, lambda 6103 A Ca 1, and H alpha lines with the aid of a double magnetograph. It was statistically found that the location of the largest longitudinal magnetic fields in the magnetic hills, as well as the places of maximum brightness in the active and the quiescent areas of the sun, coincided with the neutral lines in the radial velocity field. This correlation between the motions and magnetic fields holds true at different levels in the solar atmosphere and at different distances from the center of the disc. The fact that the radial velocities are zero in the regions of maximum longitudinal magnetic fields suggests that the gas probably moves across the magnetic lines of force. Author

N74-13521 New York Univ., N.Y.
OBSERVATIONS OF THE COSMIC RAY MODULATION FROM NEUTRON MEASUREMENTS AT THE HIGH LATITUDE TRANSITION MAXIMUM Ph.D. Thesis
Howard J. Verschell 1972 157 p
Avail: Univ. Microfilms Order No. 73-19979

Measurements of secondary neutrons were used to examine some features in the modulation of cosmic rays. The nonuniqueness of the regression curves of the 2 to 10 MeV neutron flux vs the neutron monitor counting rates indicate that the rigidity (P) dependence of the long term variation was not independent of time. The change in the P-dependence can generally be associated with the occurrence of various short term phenomena. The rigidity dependence of the modulation is relatively independent of time for extended periods of time between events.

particularly following cosmic ray minimum. The modulation during short term decreases in the cosmic ray intensity is found to be less rigidity dependent than for the long term variation. The observed increases in the 2 to 10 MeV neutron flux resulting from protons of solar origin are compared with the values obtained from a Monte Carlo transport calculation. The calculated neutron flux is generally greater than the observed, especially for low energy events. Dissert. Abstr.

N74-13522*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECTS OF HEAVY IONS ON ELECTRON TEMPERATURES IN THE SOLAR CORONA AND SOLAR WIND
M. P. Nakada [1972] 20 p refs Submitted for publication (NASA-TM-X-69899) Avail: NTIS HC $3.00 CSCL 03B

The effects of the reduction in the thermal conductivity due to heavy ions on electron temperatures in the solar corona and solar wind are examined. Large enhancements of heavy ions in the corona appear to be necessary to give appreciable changes in the thermal gradient of the electrons. Author

N74-13523# International Geophysical Year World Data Center A, Asheville, N.C.
COLLECTED DATA REPORTS ON AUGUST 1972 SOLAR-TERRESTRIAL EVENTS, PART 1
Helen E. Coffey, ed. Environmental Data Service Jul. 1973 292 p refs Sponsored by NOAA
(UAG-28-Pt-1) Avail: NTIS MF $1.45; National Climatic Center, Federal Building, Asheville, N.C. 28801. Attn: Publications HC $1.50

The optical and radio observations of the solar events for August 1972 are reported. For individual titles, see N74-13524 through N74-13526.

N74-13524 International Geophysical Year World Data Center A, Asheville, N.C.
SUMMARIES OF AUGUST 1972 EVENTS
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 1 Jul. 1973 p 1-10 refs (For availability see N74-13523 04-29)

The solar events for the declining stage of the solar cycle are briefly summarized for August 1972. The events summarized include: optical observations, radio observations, space observations, and geomagnetism. F.O.S.

N74-13525 International Geophysical Year World Data Center A, Asheville, N.C.
SOLAR OPTICAL DATA
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 1 Jul. 1973 p 11-166 refs (For availability see N74-13523 04-29)

The optical solar observations are reported. The forecasts of the August events are analyzed along with the photospheric and chromospheric structures. Limb features and the magnetic fields are described. F.O.S.

N74-13526 International Geophysical Year World Data Center A, Asheville, N.C.
SOLAR RADIO DATA **c07**
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 1 Jul. 1973 p 167-285 refs (For availability see N74-13523 04-29)

The solar radio observations for August 1972 are analyzed for the active region associated with strong S-component. Four major radio bursts were produced on August 2, 4, and 7. The evolution of the S-component is described along with the polarization distribution favorable for the occurrence of a proton flare. Time histories of the major bursts are included. Discrepancies among the maximum fluxes and microwave frequencies are discussed. F.O.S.

N74-13527# International Geophysical Year World Data Center A, Asheville, N.C.
COLLECTED DATA REPORTS ON AUGUST 1972 SOLAR-
Federal Building, Asheville, N.C. 28801. Attn: Publications HC $1.50

The space, cosmic ray, and ionospheric observations of the solar events for August 1972 are reported. For individual titles, see N74-13528 through N74-13530.

N74-13528 International Geophysical Year World Data Center A, Asheville, N.C.
SPACE OBSERVATIONS
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 287-391 refs (For availability see N74-13527 04-29)

Papers are presented which report detailed information on the X-ray, gamma ray, and energetic charged particle emissions from the sun, at earth, during the July 26 - August 14 interval. The conditions of the solar wind, the character of the interplanetary shocks, the nature of the magnetic and electric fields, and the response of the magnetosphere to the highly disturbed conditions are discussed. Author

N74-13529 International Geophysical Year World Data Center A, Asheville, N.C.
COSMIC RAYS
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 393-487 refs (For availability see N74-13527 04-29)

Cosmic ray events during August 1972 are reported. Forbush decreases, enhance modulation of the neutron monitor intensity, and cosmic ray modulations are analyzed. F.O.S.

N74-13530 International Geophysical Year World Data Center A, Asheville, N.C.
IONOSPHERE **c13**
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 489-585 refs (For availability see N74-13527 04-29)

Ionospheric observations of the August 1972 solar-terrestrial phenomena are reported. Sudden ionospheric disturbances, polar cap absorption, ionospheric storms, electron density, and atmospheric density are discussed. F.O.S

N74-13531# International Geophysical Year World Data Center A, Asheville, N.C.
COLLECTED DATA REPORTS ON AUGUST 1972 SOLAR-TERRESTRIAL EVENTS, PART 3
Helen E. Coffey, ed. Environmental Data Service Jul. 1973 308 p refs Sponsored by NOAA
(UAG-28-Pt-3) Avail: NTIS MF $1.45, National Climatic Center, Federal Building, Asheville, N. C. 28801. Attn: Publications HC $1.50

Papers concerning the geomagnetic effects of the solar events of August 1972, and information on aeronomy are presented. For individual titles, see N74-13532 through N74-13533.

N74-13532 International Geophysical Year World Data Center A, Asheville, N.C.
GEOMAGNETISM **c13**
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 685-782 refs (For availability see N74-13531 04-29)

Papers on the geomagnetic effects of the solar events of August 1972 are presented. Topics discussed include descriptions of the storms and related solar activity, magnetic perturbations preceding the storms, and pulsations. Author

N74-13533 International Geophysical Year World Data Center A, Asheville, N.C.
AERONOMY AND MISCELLANEOUS **c13**
In its Collected Data Rept. on Aug. 1972 Solar-Terrest. Events, Part 3 Jul. 1973 p 783-812 refs (For availability see N74-13531 04-29)

N74-13534*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE FOKKER-PLANCK COEFFICIENT FOR PITCH-ANGLE SCATTERING OF COSMIC RAYS
L. A. Fisk, M. L. Goldstein, A. J. Klimas, and G. Sandri (Aeronautical Res. Associates of Princeton, Inc.) Oct. 1973 37 p refs Submitted for publication
(NASA-TM-X-70527; X-660-73-320) Avail: NTIS HC $4.00 CSCL 04A

For the case of homogeneous, isotropic magnetic field fluctuations, it is shown that most theories which are based on the quasi-linear and adiabatic approximation yield the same integral for the Fokker-Planck coefficient for the pitch angle scattering of cosmic rays. For example, despite apparent differences, the theories due to Jokipii and to Klimas and Sandri yield the same integral. It is also shown, however, that this integral in most cases has been evaluated incorrectly in the past. For large pitch angles these errors become significant, and for pitch angles of 90 deg the actual Fokker-Planck coefficient contains a delta function. The implications for these corrections relating cosmic ray diffusion coefficients to observed properties of the interplanetary magnetic field are discussed. Author

N74-13535*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE NATURE OF THE UNIDENTIFIED HIGH LATITUDE UHURU SOURCES
S. S. Holt, E. A. Boldt, P. J. Serlemitsos, S. S. Murray (Harvard Coll. Obs.), R. Giacconi (Harvard Coll. Obs.), E. M. Kellogg (Harvard Coll. Obs.), and T. A. Matilsky (Am. Sci. and Eng., Inc., Cambridge, Mass.) Nov. 1973 18 p refs Submitted for publication
(NASA-TM-X-70541; X-661-73-361) Avail: NTIS HC $3.00 CSCL 04A

It is found that the unidentified high latitude UHURU sources can have either of two very different explanations. They must either reside at great distances with luminosity equivalent to or greater than 10 to the 46th power ergs/sec, or be contained in the galaxy with luminosity equivalent to or less than 10 to the 34th power ergs/sec. The two possibilities are indistinguishable with the available data. Author

N74-13536*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACE RADIATION INCIDENT ON SATS MISSIONS
E. G. Stassinopoulos Nov. 1973 449 p refs
(NASA-TM-X-70544; X-601-73-384) Avail: NTIS HC $24.50 CSCL 03B

A special orbital radiation study was conducted in order to evaluate mission encountered energetic particle fluxes. This information is to be supplied to the project subsystem engineers for their guidance in designing flight hardware to withstand the expected radiation levels. Flux calculations were performed for a set of 20 nominal trajectories placed at several altitudes and inclinations. Temporal variations in the ambient electron environment were considered and partially accounted for. Magnetic field calculations were performed with a current field model, extrapolated to the tentative SATS launch epoch with linear time terms. Orbital flux integrations ware performed with the latest proton and electron environment models, using new computational methods. The results are presented in graphical and tabular form. Estimates of energetic solar proton fluxes are given for a one year mission at selected integral energies ranging from 10 to 100 Mev, calculated for a year of maximum solar activity during the next solar cycle. Author

N74-13537# California Univ., Livermore. Lawrence Livermore Lab.
SOLAR PONDS EXTENDED
A. F. Clark 27 Jul. 1973 12 p refs
(Contract W-7405-eng-48)
(UCID-16317) Avail: NTIS HC $3.00

An effort was made to find and develop a system to produce electrical power from solar energy. The largest item of cost in a solar energy system is the collector, and a solar pond can be made very cheaply compared to mirrors or metal collection or multilayered glass systems. The heat can be transported by, stored in, and extracted from water very readily and relatively inexpensively. The present concepts feature a shallow pond that is quickly and readily heated and can be emptied at night, cutting down on the thermal losses. The pond would be filled only when the solar radiation is strong enough to heat the water. The rest of the time the water would be stored in a large insulated reservior, thus providing as much heat energy storage as desired and certainly enough to last more than a day or so. Calculations indicate that a thermodynamic cycle using some fluid other than water could be more efficient in extracting power. A Freon 11 liquid-vapor system could be the appropriate fluid to run the turbine and generate electricity. Waste heat could be disposed of in a water cooling tower. NSA

N74-13538# California Univ., Berkeley. Lawrence Berkeley Lab.
CALCULATIONS ON A SOLAR ENERGY SYSTEM
R. M. Graven 8 Mar. 1973 33 p refs Presented at the Intern. Meeting on the Solar Energy Soc., Cleveland, 3 Oct. 1973
(Contract W-7405-eng-48)
(LBL-1773; Conf-731002-1) Avail: NTIS HC $3.75

A computer program has been used to calculate the amount of energy which can be extracted from a flat plate solar collector. The computations consider latitude, heat loss, daily temperature range, percent cloud cover, sun angle, etc. to determine the feasibility of home heating for an angularly adjustable solar collector in the Northern Hemisphere. The program also calculates the energy available from a solar-earth heat pump. The influence of design parameters and the feasibility of using solar energy to generate heat and electricity for a small single family residence have been considered. Author (NSA)

N74-13539# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. of Ricerca Tecnologia per lo Studio del Plasma nello Spazio.
THE COSMIC RAY SPECTRAL MODULATION ABOVE 2GV. PART 4: THE INFLUENCE ON THE ATTENUATION COEFFICIENT OF THE NUCLEONIC COMPONENT
F. Bachelet, N. Iucci, G. Villoresi, and N. Zangrilli Feb. 1972 28 p refs
(LPS-72-4) Avail: NTIS HC $3.50

The influence of the primary cosmic ray modulation on the attenuation coefficient of the nucleonic component at different latitudes and altitudes was investigated. Direct investigation of the time behavior of the station attenuation coefficients was based on refined data, from the revised data the IGY neutron monitors 1957-1965 and the IQSY supermonitor data 1965-1969. The results of the correlation between this time behavior and the time changes of the nucleonic intensity are in agreement with the estimates based on the solar cycle modulation of the primary spectrum. The results are also presented in a form suitable for use in accurate pressure correction of the data from the network neutron monitors. Author (ESRO)

N74-13540# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
A TECHNIQUE FOR THE STUDY OF SHORT TERM COSMIC RAY VARIATIONS. PART 3: THE AVERAGE DIURNAL AND SEMIDIURNAL VARIATIONS
L. R. Barnden Apr. 1972 74 p refs
(LPS-72-8-Pt-3) Avail: NTIS HC $5.75

The origin-of-scatter technique is applied to determine the relationship between the average diurunal and semidiurnal variations observed on earth, and the cosmic ray radial gradient and scattering mean free paths in interplanetary space. The results are detailed. It was found that the best-fit radial gradient associated with the average diurnal variation near solar maximum has an amplitude of 39/p percent/AU when the mean free paths have a power one r - dependence. The diurnal variation calculated with these best-fit parammeters has a rigidity dependence characterized by beta = +0.2 for P below 25GV and beta = -1.0 for P above 25GV. It is shown that the semidiurnal variation arises as a natural consequence of the radial dependence of the number density when the mean free paths have a power one r-dependence. The calculated semidiurnal variation has a rigidity dependence with beta = +1.2 for P below 30GV, above which the value of beta begins to decrease. Author (ESRO)

N74-13541# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
MOTIONS OF THE BOW SHOCK INDUCED BY INTERPLANETARY DISTURBANCES
Heinrich J. Voelk and Rolf-Dieter Auer Jul. 1973 45 p refs Submitted for publication
(MPI-PAE/Extraterr-85) Avail: NTIS HC $4.25

Recent observations of very high bow shock normal velocities have led to investigations of shock reactions to changes in solar wind conditions for different bow shock locations. At low quiescent Mach numbers, the shock was found to be much more sensitive to a given slow perturbation than at the normally occurring high Mach numbers. Thus, under these circumstances, even a smooth wavelike disturbance can cause high bow shock velocities. For high Mach numbers only, impulsive perturbations like tangential discontinuities or occasional interplanetary shocks can induce high bow shock velocities. The former interaction is discussed. Large induced shock velocities are possible, although very strong density discontinuities are needed to produce recently estimated average shock speeds of about 85 km/ sec. Such high average shock velocities are difficult to understand. Author (ESRO)

N74-13542# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
NONLINEAR PERTURBATION THEORY FOR COSMIC RAY PROPAGATION IN RANDOM MAGNETIC FIELDS
Heinrich J. Voelk Aug. 1973 40 p refs Submitted for publication
(MPI-PAE/Extraterr-87) Avail: NTIS HC $4.00

A nonlinear perturbation theory was applied to the problem of pitch angle diffusion of energetic particles in random magnetic fields. To keep the analysis simple, fluctuation fields, consisting of Alfven waves only are discussed. It is shown that the failure of quasi-linear theory at small particle velocities parallel to the average field can be overcome by a statistically exact treatment of the particle orbits in the first order fields. In fact, for special power spectra which, in addition, do not fall off-too steeply with increasing frequency, the conventional perturbation theory also leads to formally convergent expressions for the scattering mean free path. These results are shown to be quite satisfactory, even in a quantitative sense. For more general physically realistic power spectra, however, a divergence-free diffusion theory is indispensible. A simple representation for the resulting pitch-angle diffusion coefficient is suggested. Author (ESRO)

N74-13543# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
SPATIAL DEPENDENCE OF THE PITCH-ANGLE AND ASSOCIATED SPATIAL DIFFUSION COEFFICIENTS FOR COSMIC RAYS IN INTERPLANETARY SPACE
Heinrich J. Voelk, Gregor Morfill, Werner Alpers, and Martin A. Lee Aug. 1973 58 p refs Submitted for publication
(MPI-PAE/Extraterr-88) Avail: NTIS HC $5.00

The spatial dependence of the pitch-angle and associated spatial diffusion coefficients for cosmic ray particles in interplanetary space was calculated in the WKB approximation. The model considers only Alfven waves of solar origin responsible for the scattering of moderate energy particles. Results are presented for the asymptotic case corresponding to radial distances r greater than about 1 to 2 AU. The radial mean free path turns out to increase proportionally at medium and low heliographic latitudes. This behavior is consistent with a very small radial cosmic ray gradient and the existence of a free boundary for particle diffusion. At equal radial distances, the high latitude mean free path is not only much smaller than the one calculated at the lower latitudes but, in addition, increases only weakly with distance. Some conceivable dynamical implications for the outer solar system are indicated. Author (ESRO)

N74-13544# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
THE COSMIC RAY SPECTRAL MODULATION ABOVE 2 GV DURING THE DESCENDING PHASE OF SOLAR CYCLE NO. 19. PART 1: A COMPREHENSIVE TREATMENT OF THE NEUTRON MONITOR DATA FROM THE WORLDWIDE STATION NETWORK AND LATITUDE SURVEYS
F. Bachelet, N. Iucci, G. Villoresi, and B. Sporre (Uppsala Univ.) Jan. 1971 29 p refs
(LPS-71-3) Avail: NTIS HC $3.50

The short- and long-term spectral modulation of primary cosmic rays above 2 GV during the time from the IGY to the IQSY is studied, for a large part of solar cycle no. 19. Information on the modulation is gained by means of neutron monitor data. This information covers a fair primary rigidity range and offers a time and rigidity resolution which is not reached by other experimental data. An indirect calibration procedure of the whole network of the near sea level neutron monitors is reviewed. Author (ESRO)

N74-13545# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Teconologia per lo Studio del Plasma nello Spazio.
THE COSMIC RAY SPECTRAL MODULATION ABOVE 2 GV DURING THE DESCENDING PHASE OF SOLAR CYCLE NO. 19. PART 2: A STUDY OF LARGE FORBUSH DECREASES
F. Bachelet, N. Iucci, and G. Villoresi Jan. 1971 18 p refs
(LPS-71-4) Avail: NTIS HC $3.00

The short- and long-term spectral modulation of primary cosmic rays above 2 GV during the time span from the IGY to the IQSY, through a large part of solar cycle no. 19 are discussed. The daily sea-level latitude curves obtained by the revision and normalization procedure of the neutron monitor daily data were used to derive the isotropic primary spectral variation on the occasion of 14 large Forbush decreases. The criteria adopted in order to reach satisfactory accuracy in the modulation amplitude and avoid spurious or anisotropic effects are reported. Due to the high precision and good rigidity coverage of the data used, detailed information on the modulation function in the studied rigidity region was reached for the first time. The Forbush decrease modulation showed fairly constant behavior through the solar cycle. Author (ESRO)

N74-13546# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
EVIDENCE FOR EMISSION OF COSMIC RAYS BY JUPITER
G. Pizzella and G. Venditti Jan. 1973 27 p refs
(LPS-73-2) Avail: NTIS HC $3.50

A correlation search on the contribution of Jupiter magnetosphere to cosmic ray production is presented. Cosmic ray data obtained with a world neutron monitor network were analyzed for the period 1961 to 1965 for stations with cutoff energy above 6.3 GeV. Strong evidence was found that the cosmic ray flux is about one percent larger where the earth passes across the interplanetary magnetic field line intersecting the Jupiter orbit. The results are shown to be useful for obtaining information on the matter present in interstellar space. Further data analysis should be performed, including data from stations with a lower energy cutoff, in order to investigate whether or not the Jovian contribution is the main one to the 40 GeV cosmic ray protons in the solar system. ESRO

N74-13547# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
VARIATIONS OF THE ALPHA-PARTICLE ABUNDANCE IN THE SOLAR WIND
G. Moreno and F. Palmiotto Jan. 1973 10 p refs
(LPS-73-5) Avail: NTIS HC $3.00

The solar wind helium abundance values as measured by the HEOS 1 and Vela 3 satellites, respectively, are almost equal at low velocities and become more and more different with increasing bulk velocity. Both sets of measurements show a decrease with increasing proton flux, which seems to be in agreement with a diffusion model of the expanding corona of Nakada. ESRO

N74-13548# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
SHORT AND LONG-TERM VARIATIONS IN THE COSMIC RAY INTENSITY AND THEIR CONNECTION WITH THE 5303 A CORONAL LINE INTENSITY IN SOLAR CYCLE NO. 20

N. Iucci, M. Parisi, and G. Villoresi Mar. 1973 38 p refs
(LPS-73-8) Avail: NTIS HC $4.00

The cosmic ray modulation in the period 1965 to 1970 was investigated by comparing intensity data of groundbased stations with different response to primaries. The step-like modulation is found to be produced by the overlapping between the quasi-stationary solar cycle modulation and the Forbush decrease events. A good correlation between the cosmic ray variance (Forbush decrease index) and the lambda 5303 coronal intensity at middle heliolatitudes was found, while the quasi-stationary solar cycle modulation is well correlated with the lambda 5303 intensity near the solar equator. The different time behavior of the solar activity at different heliolatitudes causes the step-like modulation. Author (ESRO)

N74-13549# Consiglio Nazionale della Ricerche, Pisa (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.

THE STRUCTURE OF THE EARTH'S BOW SHOCK

M. Dobrowolny and V. Formisano Mar. 1973 124 p refs
(LPS-73-11) Avail: NTIS HC $8.25

A review of satellite observation and theoretical studies on the earth's bow shock is presented. A weakly nonlinear plasma theory is shown to account well for laminar structures, and models of anomalous resistivity for low Mach numbers can be developed. A more detailed analysis is required for turbulent and mixed structures. Present research concentrates on turbulent bow shock studies with regard to the mechanisms explaining the strong anomalous ion dissipation in the shock transition. In mixed structures, however, the low frequency upstream waves appear to determine the essential structure of features. ESRO

N74-13550# Consiglio Nazionale della Ricerche, Pisa (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.

INFLUENCE OF THE PRESSURE ANISOTROPY ON THE MHD REDUCED SHOCK RELATIONS

Bruno Bavassano Apr. 1973 17 p refs
(LPS-73-13) Avail: NTIS HC $3.00

Magnetohydrodynamic reduced shock relations were considered and their modifications due to an anisotropic plasma thermal pressure were investigated. Density and velocity jumps were obtained as functions of tangential magnetic field jump, Alfvenic Mach number, and anisotropy parameters. For low Mach number moderate departures from the isotropic case appear, thus emphasizing the importance of the pressure tensor determination. Author (ESRO)

N74-13551# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.

OBSERVATION OF INTERPLANETARY SHOCKS ON 4 AUGUST 1972

M. B. Cattaneo, P. Cerulli-Irelli, L. Diodato, A. Egidi, G. Moreno, and P. C. Hedgecock (Imp. Coll. of Sci. and Technol., London) May 1973 19 p refs Partly sponsored by the Brit. Sci. Res. Council
(LPS-73-14) Avail: NTIS HC $3.00

Plasma and magnetic field observations performed by the ESRO satellite HEOS-A2 during a series of large interplanetary shocks which took place 4 August 1972 are described. The S-202 experiment performed measurements of positive ions and electrons, as a function of flow direction and energy, in the range from 10 eV/g to 40 KeV/g. The plasma sensor consisted of an electrostatic analyzer with 2 Faraday cups and 2 channeltrons as particle detectors. The multiple detector system allowed the simultaneous measurement of proton and electron fluxes. Only the Faraday cup data are discussed. ESRO

N74-13552# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca Tecnologia per lo Studio del Plasma nello Spazio.

FAR MAGNETOSPHERIC FIELD OBSERVATIONS BY PIONEER 8: THE DISTANT BOW SHOCK AND THE EXTENDED TAIL

B. Bavassano, F. Mariani, and U. Villante (Aquila Univ., Italy) Jul. 1973 26 p refs
(LPS-73-16) Avail: NTIS HC $3.50

Pioneer 8 magnetic field observations of bow shock and the geomagnetic tail at large geocentric distances were investigated. The existence of the bow shock was established as far as 230 R sub E. Magnetic observations during the time of the expected tail encounters were compatible with the existence of a well shaped tail at geocentric distances as large as 500 R sub E although mixed with filamentary structures. A reasonable agreement with plasma based identification was found. Some considerations on the observed field strength in the tail and the ratio of thermal to magnetic pressure in the distant magnetosheath are presented. Author (ESRO)

N74-13553# Consiglio Nazionale della Ricerche, Pisa (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.

THE COSMIC RAY SPECTRAL MODULATION ABOVE 2GV DURING THE DESCENDING PHASES OF SOLAR CYCLE NO. 19. PART 5: THE INFLUENCE ON THE COUPLING FUNCTIONS OF THE NUCLEONIC COMPONENT

F. Bachelet, N. Iucci, M. Parisi, and G. Villoresi Jul. 1973 18 p refs
(LPS-73-17) Avail: NTIS HC $3.00

The coupling functions of the nucleonic component of cosmic rays at sea level and at about 1900 m.a.s.l. were computed for different modulation levels in solar cycle No.19. The coupling functions are given for the first time with a high degree of accuracy because of the good knowledge of the sea level latitude effect of the nucleonic component at any wanted time and of the variations of the attenuation coefficient with latitude, altitude, and solar cycle. Author (ESRO)

N74-13554# Oxford Univ. (England). Dept. of Astrophysics.

SOURCE COUNTS AND BACKGROUND FLUCTUATIONS IN X RAYS

A. Cavaliere Rome CNR Jul. 1973 26 p refs Sponsored by CNR
(LPS-73-18) Avail: NTIS HC $3.50

Measurement of the cell to cell fluctuations in X-ray background radiation contains information equivalent to a source count below the minimum resolvable source. The parameters of a power law distribution of the sources vs. flux can be bounded from the analysis of the second order fluctuations, and may be reconstructed explicitly from the second and third order fluctuations. Author (ESRO)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-13555 Rice Univ., Houston, Tex.

PLASMA IN THE GEOMAGNETIC TAIL OBSERVED BY THE CHARGED PARTICLE LUNAR ENVIRONMENT EXPERIMENT Ph.D. Thesis

Frederick Joseph Rich 1973 148 p
Avail: Univ. Microfilms Order No. 73-21590

The characteristics of the plasma sheet in the magnetotail based on the data obtained with the Charged Particle Lunar Environment Experiment (CPLEE) are analyzed. Before starting a direct study of the plasma sheet, a study of lunar surface-plasma sheet interactions is taken up and the electrostatic field associated with the photoelectron layer is found to consist of a surface potential less than 50 V and an overshoot potential of more than minus 50 V above the surface. The shadowing of particles at the CPLEE location by the lunar disk is shown generally not to occur for plasma sheet particles. This may be due to rapid, random passage (more than 40 km/sec) of magnetotail field lines with respect to the lunar surface and/or to diffusion of plasma sheet electrons into the flux tubes in contact with the lunar surface. Dissert. Abstr.

N74-13556 Rice Univ., Houston, Tex.

OBSERVATION OF IONS FROM THE LUNAR ATMOSPHERE

Ph.D. Thesis
Robert Allen Lindeman 1973 171 p
Avail: Univ. Microfilms Order No. 73-21570

The analysis of five months (August - December, 1971) of data from the Suprathermal ion detector experiment deployed on Apollo Missions 14 and 15 showed that the observation of low energy ions (10 - 100 eV) can be grouped into four categories. The first is based on a resonant interaction between the lunar surface potential and the internal voltages of the instrument. The second type is due to acceleration of ions in the lunar atmosphere by the surface potential. The third category is based on the acceleration of ions in the lunar atmosphere by the interplanetary electric field. These events have a wide energy spectrum and are observed only when the interplanetary electric field has a strong component in the ecliptic plane. The fourth type still has an unknown origin. These ions are observed in the geomagnetic tail. The present data cannot differentiate between a lunar or a magnetospheric origin. Dissert. Abstr.

N74-13557 Cornell Univ., New York.
HADAMARD TRANSFORM SPECTROSCOPY FOR FAR INFRARED ASTRONOMICAL OBSERVATIONS Ph.D. Thesis
Perry Gust Phillips 1973 152 p
Avail: Univ. Microfilms Order No. 73-22520

A Hadamard-transform spectrometer (HTS) - that is, a dispersive multiplexing spectrometer using binary orthogonal codes - has been constructed and used for laboratory and for far infrared astronomical observations. The double multiplexing scheme (DHTS) - in which radiation is multiplexed at the entrance and at the exit slit positions - allows one to recover both Fellgett's advantage and the high throughput advantage normally attributed to Michelson interferometers. Astronomical observations of the Moon, Mars, Venus and Jupiter are presented. It is shown that the atmospheric profile of the earth between 16-25 micron is rather insensitive to water vapor content once saturated lines are formed. Absorption features of NH3 are observed in the Jovian atmosphere. Dissert. Abstr.

N74-13558 Stanford Univ., Calif.
OPTIMAL RENDEZVOUS IN THE NEIGHBORHOOD OF A CIRCULAR ORBIT Ph.D. Thesis
Jeremy Boyd Jones 1973 176 p
Avail: Univ. Microfilms Order No. 73-20486

The general orbital rendezvous problem requires that the position and velocity vectors of two spacecraft be matched by a specified final time. The spacecraft, one of which performs the required velocity changes, may be in arbitrary initial orbits and the maneuvers are initiated on or after a given initial time. Within this general problem, the attention is restricted to the case where the orbits of both vehicles are in the neighborhood of a reference circular orbit. In addition the velocity changes are applied impulsively. Given these restrictions the particular set of maneuvers is selected which will accomplish the rendezvous with a minimum velocity change. The problem is formulated in terms of the relative changes required to the orbit elements which include one parameter describing the phase change. The optimization leads to a minimum time type problem with the Hamiltonian being linear in the impulse directions.
Dissert. Abstr.

N74-13559 British Library Lending Div., Boston Spa (England).
ASTRO-CLIMATIC CONDITIONS IN THE CRIMEA DEDUCED FROM OBSERVATIONS WITH DIFFERENT TELESCOPES AT THE CRIMEAN ASTROPHYSICAL OBSERVATORY AND THE SHTERNBERG INSTITUTE SOUTHERN STATION
Aug. 1973 6 p ref Transl. into ENGLISH from Astron. Tsirk. (USSR), v. 729, 1972 p 1-5
(BLL-RTS-8384) Avail: British Library Lending Div., Boston Spa, Engl.: £0.50 or 2 BLL photocopy coupons

An assessment of the quality of astronomical viewing in the Crimea is presented. Data on image quality, and the number of clear nights from the logs of four telescopes, located within a small area of 350 by 60 m are reported. The influence of topographical contouring and the height of the tower are discussed. F.O.S.

N74-13560 Michigan State Univ., East Lansing.
IMPLICATIONS OF A LUNAR FLYBY ENCOUNTER WITH EARTH Ph.D. Thesis
Robert Joseph Malcuit 1973 59 p
Avail: Univ. Microfilms Order No. 73-20372

A capture origin of the moon involved one or more close flyby (noncapture) encounters with earth prior to the formation of the moon's current geocentric orbit. Computer simulation modeling of the physical consequences of such encounters suggests that a lunar body with a rigid crust could have been profoundly affected only (1) if the encounter was well within the weightlessness limit of the earth-moon system and (2) if the lunar upper mantle could yield large quantities of magma over the very short period of time while within this weightlessness limit. Under the above conditions, a substantial mass of lunar crust and upper mantle material could be pulled from the lunar surface and interior by earth's gravity and either escape from the moon or fall back onto the lunar surface.
Dissert. Abstr.

N74-13561 Missouri Univ., Columbia.
INTERNAL CHARACTERISTICS OF VISCOUS, DIFFERENTIALLY-ROTATING STARS: COMPLETELY DEGENERATE WHITE DWARFS Ph.D. Thesis
Keith Ray Honey 1972 204 p
Avail: Univ. Microfilms Order No. 73-21786

The structure of a rotating white dwarf star is investigated by considering the equations of hydrodynamics for a rotating fluid composed of completely degenerate matter. The effects of the viscous stresses as well as the Coriolis, gravitational, and centrifugal forces are included. The shear and bulk viscosity coefficients are determined for a completely degenerate Fermi gas. The hydrodynamic equations are obtained for the case where the star exhibits complete symmetry with respect to the axis of rotation. The boundary conditions necessary for complete solution to these equations are simplified by considering the equations in terms of a mass coordinate system. These equations, are then written in the form of differential correction equations, and a mathematical technique by which a solution might be obtained is discussed. Dissert. Abstr.

N74-13562*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THE REFLECTION EFFECT IN Hz HERCULES
Robert E. Wilson 1972 8 p refs
(NASA-TM-X-69478) Avail: NTIS HC $3.00 CSCL 03A

The magnitude brightness variation due to binary star reflection effect is considered, along with tidal distortion effects. The flat region in the Milne-Sen Law is also reviewed, including the nonfit observations. Several studies are included in this binary star program investigation. J.A.M.

N74-13563*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ARTIFICAL METEOR ABLATION STUDIES: OLIVINE
Maxwell B. Blanchard and Gary G. Cunningham (Calif. State Univ., San Jose) Oct. 1973 32 p refs
(NASA-TM-X-62312) Avail: NTIS HC $3.75 CSCL 03B

Artificial meteor ablation was performed on a Mg-rich olivine sample using an arc-heated plasma of ionized air. Experimental conditions simulated a meteor traveling about 12 km/sec at an altitude of 70 km. The mineral content of the original olivine sample was 98% olivine (including traces of olivine alteration products) and 2% chromite. Forsterite content of the original olivine was Fo-89. After ablation, the forsterite content had increased to Fo-94 in the recrystallized olivine. In addition, lamella-like intergrowths of magnetite were prevalent constituents. Wherever magnetite occurred, there was an increase in Mg and a corresponding decrease in Fe for the recrystallized olivine. The Allende fusion crust consisted of a recrystallized olivine, which was more Mg-rich and Fe-deficient than the original meteorite's olivine, and abundant magnetite grains. Although troilite and pentlandite were the common opaque mineral constituents in this meteorite, magnetite was the principal opaque mineral found in the fusion crust. Author

N74-13564*# Stanford Univ., Calif.
DEFINITION PHASE OF GRAND TOUR MISSIONS/RADIO

SCIENCE INVESTIGATIONS STUDY FOR OUTER PLANETS MISSIONS Final Report
G. L. Tyler 1 Feb. 1972 29 p refs
(Grants NGR-05-020-529; NGR-05-020-530)
(NASA-CR-136219) Avail: NTIS HC $3.50 CSCL 22A

Scientific instrumentation for satellite communication and radio tracking systems in the outer planet exploration mission is discussed. Mission planning considers observations of planetary and satellite-masses, -atmospheres, -magnetic fields, -surfaces, -gravitational fields, solar wind composition, planetary radio emissions, and tests of general relativity in time delay and ray bending experiments. G.G.

N74-13565# Arizona Univ., Tucson.
THE LUNAR AND PLANETARY LABORATORY AND ITS TELESCOPES, VOLUME 9, PART 4
Gerard P. Kuiper, ed. 31 Dec. 1972 53 p refs
(LC-62-63619; Communication-172) Avail: NTIS HC $4.75

The LPL Campus and observatory facilities are described. Facilities described include: the Space Science Building, Catalina Observatory, Mt. Lemmon IR Observatory, and supplementary observatory facilities. Airborne programs and participation in NASA Deep Space Missions are also described. F.O.S.

N74-13566*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIATION WITH INTERPLANETARY SECTOR OF THE TOTAL MAGNETIC FIELD MEASURED AT THE OGO 2, 4, AND 6 SATELLITES
R. A. Langel Nov. 1973 32 p refs
(NASA-TM-X-70531; X-645-73-356) Avail: NTIS HC $3.75 CSCL 03B

Variations in the scalar magnetic field (delta B) from the polar orbiting OGO 2, 4, and 6 spacecraft are examined as a function of altitude for times when the interplanetary magnetic field is toward the sun and for times when the interplanetary magnetic field away from the sun. This morphology is basically the same as that found when all data, irrespective of interplanetary magnetic sector, are averaged together. Differences in delta B occur, both between sectors and between seasons, which are similar in nature to variations in the surface delta Z found by Langel (1973c). The altitude variation of delta B at sunlit local times, together with delta Z at the earth's surface, demonstrates that the delta Z and delta B which varies with sector has an ionospheric source. Langel (1973b) showed that the positive delta B region in the dark portion of the hemisphere is due to at least two sources, the westward electrojet and an unidentified non-ionospheric source(s). Comparison of magnetic variations between season/sector at the surface and at the satellite, in the dark portion of the hemisphere, indicates that these variations are caused by variations in the latitudinally narrow electrojet currents and not by variations in the non-ionospheric source of delta B. Author

N74-13567*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SURFACE FEATURES ON MARS: GROUND-BASED ALBEDO AND RADAR COMPARED WITH MARINER 9 TOPOGRAPHY
Herbert Frey (Maryland Univ., College Park) Dec. 1973 35 p refs
(NASA-TM-X-70537; X-644-73-378) Avail: NTIS HC $3.75 CSCL 03B

Earth-based albedo maps of Mars were compared with Mariner 9 television data and ground-based radar profiles to investigate the nature of the bright and dark albedo features. Little correlation was found except at the boundaries of classical albedo features, where some topographic control is indicated. Wind-blown dust models for seasonal and secular albedo variations are supported, but it is not clear whether the fines are derived from bright or dark parent rock. Mars, like the Earth and Moon, has probably generated two distinct types of crustal material. Author

N74-13568*# Michigan Univ., Ann Arbor. High Altitude Engineering Lab.
STUDY OF THE TECHNIQUE OF STELLAR OCCULTATION
P. B. Hays, M. E. Graves, R. G. Roble, and A. N. Shah 30 Nov. 1973 152 p refs
(Contract NAS1-9958; Grant NGR-23-005-360)
(NASA-CR-112197) Avail: NTIS HC $9.75 CSCL 03A

The results are reported of a study of the stellar occultation technique for measuring the composition of the atmosphere. The intensity of starlight was monitored during the occultation using the Wisconsin stellar ultraviolet photometers aboard the Orbiting Astronomical Observatory (OAO-A2). A schematic diagram of an occultation is shown where the change in intensity at a given wavelength is illustrated. The vertical projection of the attenuation region is typically 60 km deep for molecular oxygen and 30 km deep for ozone. Intensity profiles obtained during various occultations were analyzed by first determining the tangential columm density of the absorbing gases, and then Abel inverting the column densities to obtain the number density profile. Errors are associated with each step in the inversion scheme and have been considered as an integral part of this study. Author

N74-13569*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STUDIES OF HYDRODYNAMIC EVENTS IN STELLAR EVOLUTION. 3: EJECTION OF PLANETARY NEBULAE
Warren M. Sparks and G. S. Kutter (Evergreen State Coll., Olympia, Wash.) Dec. 1973 30 p refs Submitted for publication
(NASA-TM-X-70536; X-671-73-370) Avail: NTIS HC $3.50 CSCL 03B

The dynamic behavior of the H-rich envelope (0.101 solar mass) of an evolved star (1.1 solar mass) as the luminosity rises to 19000 solar luminosity during the second ascent of the red giant branch. For luminosities in the range $3100 < L$ 19000 solar luminosity the H-rich envelope pulsates like a long-period variable (LPV) with periods of the order of a year. As L reaches 19000 solar luminosity, the entire H-rich envelope is ejected as a shell with speeds of a few 10 km/s. The ejection occurs on a timescale of a few LPV pulsation periods. This ejection is associated with the formation of a planetary nebula. The computations are based on an implicit hydrodynamic computer code. T- and RHO-dependent opacities and excitation and ionization energies are included. As the H-rich envelope is accelerated off the stellar core, the gap between envelope and core is approximated by a vacuum, filled with radiation. Across the vacuum, the luminosity is conserved and the anisotropy of the radiation is considered as well as the solid angle subtended by the remnant star at the inner surface of the H-rich envelope. Spherical symmetry and the diffusion approximation are assumed. Author

N74-13570*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STUDY OF AIRBORNE SCIENCE EXPERIMENT MANAGEMENT CONCEPTS FOR APPLICATION TO SPACE SHUTTLE. VOLUME 1: EXECUTIVE SUMMARY
Donald R. Mulholland, John O. Reller, Jr., Carr B. Neel, and Louis C. Haughney Jul. 1973 23 p refs
(NASA-TM-X-62288) Avail: NTIS HC $3.25 CSCL 22C

The management concepts and operating procedures are documented as they apply to the planning of shuttle spacelab operations. Areas discussed include: airborne missions; formulation of missions; management procedures; experimenter involvement; experiment development and performance; data handling; safety procedures; and applications to shuttle spacelab planning. Characteristics of the airborne science experience are listed, and references and figures are included. K.M.M.

N74-13571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE OBSERVATIONS OF TYPE 3 SOLAR RADIO BURSTS AT LOW FREQUENCIES
Joseph Fainberg and Robert G. Stone Nov. 1973 106 p refs Submitted for publication
(NASA-TM-X-70540; X-693-73-346) Avail: NTIS HC $7.50 CSCL 03B

Type III solar radio bursts were observed from 10 MHz to 10 KHz by satellite experiments above the terrestrial plasmasphere. Solar radio emission in this frequency range results from excitation of the interplanetary plasma by energetic particles propagating outward along open field lines over distances from 5 solar radii

to at least 1 AU from the sun. This review summarizes the morphology, characteristics and analysis of individual as well as storms of bursts. Burst rise times are interpreted in terms of exciter length and dispersion while decay times refer to the radiation damping process. The combination of radio observations at the lower frequencies and in-situ measurements on nonrelativistic electrons at 1 AU provide data on the energy range and efficiency of the wave-particle interactions responsible for the radio emission. Author

N74-13572# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Technical Mechanics Dept.
OPTIMUM CALCULATION OF PARTIAL DERIVATIVES IN SPACE DYNAMICS Final Report
A. Pohl Jan. 1973 236 p refs
(Contract ESOC-368/71/AR; MBB Proj. 7.650.0)
(MBB-UR-179-73; ESRO-CR(P)-292) Avail: NTIS HC $14.00

The computation of partial derivatives of the position and velocity vectors with respect to their initial values or any other parameter are discussed. Three methods were considered and compared with each other in regard to accuracy and computing time. These methods are the standard method of direct integration, the Peano-Baker method, and the method of linearization. It was concluded that the Peano-Baker method, known from the theory of differential equations and adapted for the solution of variational equations, is superior since the variational equations can be integrated with a larger step-size. ESRO

N74-13573# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
PIONEER 8 EXTRATERRESTRIAL MAGNETIC FIELD DATA PROCESSING [ELABORAZIONE DEI DATI DI CAMPO MAGNETICO EXTRATERRESTRE OTTENUTI DALLA SONDA PIONEER 8]
Bruno Bavassano and Alessandro Castelli Jul. 1972 112 p refs In ITALIAN
(LPS-72-16) Avail: NTIS HC $7.75

The computer programs for Pioneer 8 interplanetary magnetic field data reduction are presented. After a review of the technical characteristics of the magnetometer, data sequencing, and data organization on the tapes, the various computer programs are divided in three classes. The first class includes read and preanalysis routines for input data translation and dump. The second class includes the data analysis routines. A description of the control cards, main program, and subroutines are given together with the output data organization. The third class includes post elaboration and data synthesis programs. Graphical data elaboration and data statistics is also considered. For all programs, the flow chart is given, and the actual program listing is included for 8 of the most important programs. ESRO

N74-13574# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
MAGNETIZATION OF CELESTIAL BODIES WITH SPECIAL APPLICATION TO THE PRIMEVAL EARTH AND MOON
Hannes Alfven (Calif. Univ., San Diego) and L. Lindberg Aug. 1973 21 p refs Submitted for publication
(TRITA-EPP-73-13) Avail: NTIS HC $3.25

A poloidal magnetic field may be increased by the transfer of energy from a toroidal magnetic field through kink instability of the current system, as was demonstrated by laboratory experiments. This mechanism can be applied to the fluid core of a celestial body. Any differential rotation will produce a toroidal field from an existing poloidal field, and the kink instability will feed toroidal energy back to the poloidal field, and hence amplify it. In the earth-moon system the tidal braking of the earth's mantle acts to increase the differential angular velocity between core and mantle. The braking will be transferred to the core by hydromagnetic forces and at the same time give rise to a strong magnetic field. The strength of the field will be determined by the rate of tidal braking. It is suggested that the magnetization of lunar rocks from the period -4 to -3 G years derives from the earth's magnetic field. As the interior of the moon immediately after accretion probably was too cool to be melted, the moon could not produce a magnetic field by hydromagnetic effects in its core. The observed lunar magnetization could be produced by such an amplified earth field even if the moon never came closer than 10 or 20 earth's radii. Author (ESRO)

N74-13575# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Aug. 1973
Massimo Cimino Aug. 1973 10 p
(Bull-184) Avail: NTIS HC $3.00

Solar data for August 1973 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol. ESRO

N74-13576# Naval Research Lab., Washington, D.C.
CALCULATIONS OF EXPECTED PROTON FLUENCES FOR A FLYBY OF JUPITER Final Report
James W. Butler Sep. 1973 109 p refs
(AD-767308; NRL-MR-2651) Avail: NTIS CSCL 03/2

The Naval Research Laboratory was requested to study the problem of radiation survivability for the Jupiter-Saturn spacecraft beginning with the 1976 launch. This report describes in some detail one phase of the survivability project: calculations of proton fluence spectra that might be expected from Jupiter's trapped radiation on the basis of the best trapped radiation models currently available. GRA

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N74-13577 Stanford Univ., Calif.
PRECISE ATTITUDE CONTROL OF THE STANFORD RELATIVITY SATELLITE Ph.D. Thesis
John Sumter Bull 1973 294 p
Avail: Univ. Microfilms Order No. 73-20465

Analytical and experimental phases of the attitude control system synthesis and analysis for the Stanford Relativity Satellite are presented. Einstein relativity theory predicts that the axis of a gyroscope in polar earth orbit will precess 6.9 arc-seconds per year in the orbit plane and 0.05 arc-seconds per year normal to the orbit plane. In order to record accurately the relativity effect, the relative motion is measured between an ultra low drift rate gyroscope (0.001 arc-sec/yr) and a precisely controlled star tracker acting as an inertial reference frame. The satellite will contain four spherical quartz gyroscopes and a telescope in a low temperature environment provided by a liquid helium dewar. Overall satellite control will be provided through helium reaction jets utilizing helium boiloff from the dewar. Precise telescope pointing will be obtained through a fast cryogenic actuator pushing against the remainder of the satellite inertia. Dissert. Abstr.

N74-13578*# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.
OPERATIONS ANALYSIS, STUDY 2.6. VOLUME 2: ANALYSIS RESULTS Final Report
R. R. Wolfe 15 Sep. 1973 153 p refs 4 Vol.
(Contract NASw-2472)
(NASA-CR-136265; ATR-74(7336)-3-Vol-2) Avail: NTIS HC $9.75 CSCL 22A

Results are presented of the assessment of the space transportation system as it applies to future space program planning. Comparisons are given between space servicing and ground refurbishment of payloads. Mission characterization, logistic vehicle options, and payload design options are also discussed. K.M.M.

N74-13579*# Martin Marietta Corp., Denver, Colo.
SPACE SHUTTLE SOLID ROCKET BOOSTER RECOVERY SYSTEM DEFINITION, VOLUME 1 Final Technical Report
Oct. 1973 323 p
(Contract NAS8-29622)

(NASA-CR-120106; MCR-73-247-Vol-1) Avail: NTIS HC $18.25 CSCL 22B

The performance requirements, preliminary designs, and development program plans for an airborne recovery system for the space shuttle solid rocket booster are discussed. The analyses performed during the study phase of the program are presented. The basic considerations which established the system configuration are defined. A Monte Carlo statistical technique using random sampling of the probability distribution for the critical water impact parameters was used to determine the failure probability of each solid rocket booster component as functions of impact velocity and component strength capability. Author

N74-13580*# Martin Marietta Corp., Denver, Colo.
SPACE SHUTTLE SOLID ROCKET BOOSTER RECOVERY SYSTEM DEFINITION. VOLUME 3: SRB WATER IMPACT LOADS COMPUTER PROGRAM, USER'S MANUAL
Oct. 1973 77 p
(Contract NAS8-29622)
(NASA-CR-120108; MCR-73-247-Vol-3) Avail: NTIS HC $6.00 CSCL 22B

This user's manual describes the FORTRAN IV computer program developed to compute the total vertical load, normal concentrated pressure loads, and the center of pressure of typical SRB water impact slapdown pressure distributions specified in the baseline configuration. The program prepares the concentrated pressure load information in punched card format suitable for input to the STAGS computer program. In addition, the program prepares for STAGS input the inertia reacting loads to the slapdown pressure distributions. Author

N74-13581*# Martin Marietta Corp., Denver, Colo.
SPACE SHUTTLE SOLID ROCKET BOOSTER RECOVERY SYSTEM DEFINITION. VOLUME 2: SRB WATER IMPACT MONTE CARLO COMPUTER PROGRAM, USER'S MANUAL
Oct. 1973 95 p
(Contract NAS8-29622)
(NASA-CR-120107; MCR-73-247-Vol-2) Avail: NTIS HC $6.75 CSCL 22B

The HD 220 program was created as part of the space shuttle solid rocket booster recovery system definition. The model was generated to investigate the damage to SRB components under water impact loads. The random nature of environmental parameters, such as ocean waves and wind conditions, necessitates estimation of the relative frequency of occurrence for these parameters. The nondeterministic nature of component strengths also lends itself to probabilistic simulation. The Monte Carlo technique allows the simultaneous perturbation of multiple independent parameters and provides outputs describing the probability distribution functions of the dependent parameters. This allows the user to determine the required statistics for each output parameter. Author

N74-13582*# Chrysler Corp., New Orleans, La. Space Div.
SURFACE ROUGHNESS EFFECTS ON THE SUPERSONIC AERODYNAMICS OF THE ROCKWELL INTERNATIONAL 089B-139 ORBITER
George M. Ware (NASA. Langley Res. Center) and Bernard Spencer, Jr. (NASA. Langley Res. Center) Nov. 1973 218 p
(Contract NAS9-13247)
(NASA-CR-128796; DMS-DR-2054) Avail: NTIS HC $13.00 CSCL 22B

An experimental test program was conducted to determine the effects of vehicle surface roughness on the supersonic aerodynamic characteristics of a 0.01875 scale model of a space shuttle configuration. Surface roughness was simulated by applying a sparse coating of carborundum grit to complete model. Various grit sizes were investigated. The tests were conducted in a wind tunnel at Mach numbers from 1.60 to 4.63. The angle of attack was varied from about -2 deg to as much as 42 deg at 0 deg and + or - 3 deg of sideslip. The angle of sideslip was varied from -8 deg to 8 deg at angles of attack from 0 deg to 40 deg. Author

N74-13583*# Chrysler Corp., New Orleans, La. Space Div.
SURFACE ROUGHNESS EFFECTS ON THE SUBSONIC AERODYNAMICS OF THE ROCKWELL INTERNATIONAL 089B-139B ORBITER
George M. Ware (NASA. Langley Res. Center) and Bernard Spencer, Jr. (NASA. Langley Res. Center) Sep. 1973 249 p
(Contract NAS9-13247)
(NASA-CR-128782; DMS-DR-2056) Avail: NTIS HC $14.50 CSCL 22B

An experimental test program was conducted to determine the effects of vehicle surface roughness on the subsonic aerodynamic characteristics of a 0.01875 scale model of a Rockwell International Space Shuttle Configuration. Surface roughness was simulated by applying a sparce coating of carborundum grit to the complete model. Various grit sizes were investigated. Tests were conducted in the Langley Low Turbulence Pressure Tunnel at a constant nominal Mach number of 0.25 with Reynolds number varying from 2 to 12 x 10 to the 6th power per foot. Angle of attack was varied from about -2 to 28 deg at 0 deg and 6 deg angle of sideslip. Author

N74-13584*# Chrysler Corp., New Orleans, La. Space Div.
EFFECTS OF THE AIR BREATHING PROPULSION SYSTEM ON SPACE SHUTTLE ORBITER SUBSONIC STABILITY AND CONTROL CHARACTERISTICS (OA71A)
Robert C. Mennell (Rockwell Intern., Downey, Calif.) Nov. 1973 141 p
(Contract NAS9-13247)
(NASA-CR-138797; DMS-DR-2068) Avail: NTIS HC $9.25 CSCL 22B

Experimental aerodynamic investigations were conducted on an 0.0405 scale representation of the -89B (2A) Space Shuttle Orbiter in a 7.75 x 11.00 ft low speed wind tunnel during the time period from July 27, 1973 to August 3, 1973. The primary test objective was to investigate the aerodynamic effects of engine nacelle grouping and location on the orbiter ferry mission configuration. Five nacelles were tested, both individually mounted as well as mounted in a podded configuration, at the baseline position and moved 45.0 in. aft (full scale). Orbiter control effectiveness, both with and without nacelles, was recorded at elevon deflections of 0 deg, 5 deg, 10 deg, -10 deg and -20 deg and aileron deflections, about 0 deg elevon, of 0 deg, 5 deg, 10 deg, and 15 deg. The model was sting mounted on a 2.5 inch diameter internal strain gage balance entering through the base region. The nominal angle of attack range was -4 deg < or = alpha < or = 30 deg. Yaw polars were recorded over the beta range of -10 deg < or = beta < or = at fixed angles of attack of 0 deg and 10 deg. Author

N74-13585*# Chrysler Corp., New Orleans, La. Space Div.
EFFECTS OF REACTION CONTROL SYSTEM JET SIMULATION ON THE STABILITY AND CONTROL CHARACTERISTICS OF A 0.015-SCALE SPACE SHUTTLE ORBITER MODEL IN THE AMES RESEARCH CENTER 3.5-FOOT HYPERSONIC WIND TUNNEL
T. J. Dziubala (Rockwell Intern., Downey, Calif.), John Marroquin (Rockwell Intern., Downey, Calif.), J. W. Cleary (NASA. Ames Res. Center), and J. A. Mellenthin (NASA. Ames Res. Center) Nov. 1973 186 p refs
(Contract NAS9-13247)
(NASA-CR-128800; DMS-DR-2082) Avail: NTIS HC $11.50 CSCL 22B

An experimental investigation was performed in the Ames Research Center 3.5-Foot Hypersonic Wind Tunnel to obtain detailed effects which interactions between the RCS jet flow field and the local orbiter flow field have on orbiter hypersonic stability and control characteristics. Six-component force data were obtained through an angle-of-attack range of 15 to 35 deg with 0 deg angle of sideslip. The test was conducted with yaw, pitch and roll jet simulation at a free-stream Mach number of 10.3. These data simulate two SSV reentry flight conditions at Mach numbers of 28.3 and 10.3. Fuselage base pressures and pressures on the nonmetric RCS pods were obtained in addition to the basic force measurements. Model 42-0 was used for these tests. Author

N74-13586*# Chrysler Corp., New Orleans, La. Space Div.
SUBSONIC, TRANSONIC, AND SUPERSONIC STABILITY AND CONTROL CHARACTERISTICS OF THE -147B SPACE SHUTTLE ORBITER
R. C. Mennell Oct. 1973 258 p

(Contract NAS9-13247)
(NASA-CR-128789; DMS-DR-2061) Avail: NTIS HC $15.00 CSCL 22B

Experimental aerodynamic investigations were conducted on 0.015 scale representations of two Space Shuttle Orbiter configurations in a trisonic wind tunnel from June 20, 1973 to June 30, 1973. The primary test objective was to define subsonic, transonic, and supersonic stability and control characteristics of the -147B Orbiter. Six-component aerodynamic force and moment data for the -147B Orbiter were recorded over an angle of attack range of -2 deg to 30 deg at Mach numbers of 0.6, 0.9, 1.2, 2.0, and 3.0. Reynolds numbers of 5.0, 7.0, 8.0, and 9.0 x 100000 6/ft were tested at Mach numbers less than 2.0 while testing at Mach 2.0 and 3.0 was conducted at a Reynolds number of 11.0 x 100000/ft. Eleven deflections of 0 deg, +15 deg, -20, deg and -40 deg; body flap deflections of 0 deg, +13.75 deg and -14.25 deg; and rudder flare angles of 24.92 deg and 54.92 deg were tested on the -147B Orbiter over the entire Mach number range. Testing of the -139B Orbiter was for data verification and configuration comparison purposes only. Author

N74-13587*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AE-C ATTITUDE DETERMINATION AND CONTROL PRELAUNCH ANALYSIS AND OPERATIONS PLAN
R. D. Werking, R. D. Headrick, C. F. Manders, and R. D. Woolley Dec. 1973 87 p refs
(NASA-TM-X-70535; X-581-73-369) Avail: NTIS HC $6.50 CSCL 22B

A description of attitude control support being supplied by the Mission and Data Operations Directorate is presented. Included are descriptions of the computer programs being used to support the missions for attitude determination, prediction, and control. In addition, descriptions of the operating procedures which will be used to accomplish mission objectives are provided. Author

N74-13588# Lockheed Missiles and Space Co., Palo Alto, Calif.
CIRCUIT AND BLOCK DIAGRAMS OF MISSILE STABILIZATION SYSTEMS WITH ON-BOARD DIGITAL COMPUTERS, CHAPTER 2
V. D. Arens, S. M. Fedorov, M. S. Khitrik, and S. V. Luchko [1973] 9 p Transl. into ENGLISH from the book "Dinamika Sistem Upravleniia Raket s Bortovoi Tsifrovymi Vychislitelnymi Mashinami" Moscow, Mashinostr., 1972 p 35-45
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The characteristics of missile stabilization systems with on-board digital computers are discussed. The advantages of the digital computer system over the analog electronic control system are explained. The problems solved by the on-board digital computer are defined. Block diagrams are developed to show the flow of electronic signals. Mathematical models are included to analyze the characteristics of the stabilization system. Author

N74-13589*# TRW Systems Group, Redondo Beach, Calif.
FUNCTIONAL REQUIREMENTS FOR ONBOARD MANAGEMENT OF SPACE SHUTTLE CONSUMABLES, VOLUME 1 Final Report
P. J. Graf, H. A. Herwig, and L. W. Neel 16 Nov. 1973 107 p refs
(Contract NAS9-12944)
(NASA-CR-134144; TRW-22104-H001-R0-00-Vol-1) Avail: NTIS HC $7.50 CSCL 22B

A study was conducted to determine the functional requirements for onboard management of space shuttle consumables. A generalized consumable management concept was developed for application to advanced spacecraft. The subsystems and related consumables selected for inclusion in the consumables management system are: (1) propulsion, (2) power generation, and (3) environmental and life support. Author

N74-13590*# TRW Systems Group, Redondo Beach, Calif.
FUNCTIONAL REQUIREMENTS FOR ONBOARD MANAGEMENT OF SPACE SHUTTLE CONSUMABLES, VOLUME 2. Final Report
P. J. Graf, H. A. Herwig, and L. W. Neel 16 Nov. 1973 145 p refs
(Contract NAS9-12944)
(NASA-CR-134145; TRW-22104-H002-R0-00-Vol-2) Avail: NTIS HC $9.25 CSCL 22B

A study was conducted to develop the functional requirements for onboard management of space shuttle consumables. A specific consumables management concept for the space shuttle vehicle was developed and the functional requirements for the onboard portion of the concept were generated. Consumables management is the process of controlling or influencing the usage of expendable materials involved in vehicle subsystem operation. The subsystems considered in the study are: (1) propulsion, (2) power generation, and (3) environmental and life support. Author

N74-13591# Research Inst. of National Defence, Stockholm (Sweden).
TWENTY-NINTH AIRCRAFT AND SPACE EXHIBITION, PARIS 1971 [29:E FLYG-OCH RYMDUTSTAELLNINGEN I PARIS 1971]
Verner Bogren and Olle Nord Feb. 1972 47 p In SWEDISH
(FOA-3-C-3700-E8) Avail: NTIS HC $4.50

Impressions of the Paris exhibition are reported. Interest was concentrated on the electronic and rocket motor departments. Author

N74-13592# Research Inst. of National Defence, Stockholm (Sweden).
HISTORICAL REVIEW OF THE DEVELOPMENT OF BALLISTIC GUIDED MISSILES IN THE USA AND DESCRIPTIONS OF THE SYSTEMS [TILLBAKABLICK PA UTVECKLINGEN AV BALLISTISKA ROBOTAR I USA SAMT SYSTEMBESKRIVNINGAR]
Curt Haglund Feb. 1972 76 p In SWEDISH
(FOA-2-A-2552-D9; FOA-2-A-2552-F5) Avail: NTIS HC $6.00

The enormous problems are outlined which the U.S.A. had to deal with when it was realized that intercontinental ballistic missiles were required quickly. They were found to have a specification which surpassed the production of the atomic bomb during the war in regard to the cost and degree of difficulty. The report concludes with a technical description of the present operational intercontinental ballistic systems in the U.S.A. Author

N74-13593# Research Inst. of National Defence, Stockholm (Sweden).
SURVEY OF DEVELOPMENTS IN THE FIELD OF RECONNAISSANCE SATELLITES [OEVERSIKT AV UTVECKLINGEN PA SPANINGSSATELLITOMRADET]
C. Haglund Nov. 1971 53 p In SWEDISH
(FOA-2-A-2545-M6; FOA-2-A-2545-E1) Avail: NTIS HC $4.75

During the course of the year several hundred reconnaissance satellites have been sent up. By the study of data from these certain conclusions can be made about their activities. These are reviewed in the report which covers 214 Soviet and 236 American reconnaissance satellites. Author

N74-13594# Research Inst. of National Defence, Stockholm (Sweden).
VISIT REPORT ON IFAC SYMPOSIUM ON AUTOMATIC CONTROL IN SPACE, DUBROVNIK, YUGOSLAVIA, 6-10 SEPTEMBER 1971 [RESERAPPORT FRAN IFAC: S SYMPOSIUM AUTOMATIC CONTROL IN SPACE, DUBROVNIK, JUGOSLAVICN,6-10 SEPTEMBER 1971]
Gunnar Ek Nov. 1971 13 p In SWEDISH
(FOA-2-C-2502-E4) Avail: NTIS HC $3.00

Scientific research and developments of control theory and control methods particularly for satellites and spacecraft are reported. Most of the scientists taking part were from U.S.A., Jugoslavia, West Germany, Frace and Russia but even Belgium, England, Holland, Italy, Switzerland, Czechoslovakia and Austria were represented. The report contains an abridged account of the symposium. Author

N74-13595# Research Inst. of National Defence, Stockholm (Sweden).
MODELS FOR SOUNDING ROCKETS [MODELLER FOR

SONDRAKET]
Gunnar Ek Feb 1972 62 p In SWEDISH
(FOA-2-C-2524-E4/E7) Avail: NTIS HC $5.25

A three dimensional mathematical model is reported for an attitude controlled rolling space sonde; a model for a straight fall (without roll), and a further simplified model with ideal guidance together with a straight starting phase model are also described. These mathematical models have been used for simulating the Volvo-Flygmotors sonde rocket, SR-1 on IBM 360 and EAI 640 computers. Some simulation results are reviewed. Author

N74-13596# Sandia Labs., Albuquerque, N.Mex.
TRIM-ANGLE PREDICTIONS FOR A SLIGHTLY BLUNTED CONICAL REENTRY VEHICLE WITH A FLARE-SECTION ASYMMETRY
E. L. Clark, Jr. Jun. 1973 20 p refs Sponsored by AEC
(SC-DR-72-0532) Avail: NTIS HC $3.00

A method for theoretically predicting the nonrolling trim angle of attack of an asymmetrical reentry vehicle is described. The technique is applicable at supersonic Mach numbers for a slightly blunted, conical vehicle with a wedge-shaped asymmetry. Theoretical estimates obtained with this theory are compared with experimental data obtained at Mach numbers of 1.6 to 4.2, and the theory is shown to be adequate for design calculations. Empirical predictions for the Re-entry Vehicle Resonance Test Vehicle (RVRTV) are given. Author (NSA)

N74-13597# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
ELECTRICALLY CONDUCTING THERMAL CONTROL SURFACE STUDY
O. K. Husmann 30 Aug. 1973 85 p refs
(Contract ESTEC-1940/73-SK)
(MBB-UR-204-73; ESRO-CR(P)-315) Avail: NTIS HC $6.25

A literature review of the state-of-the-art of transparent conductive coatings (C.C.) and conductive paints, including preliminary experimental vapor and sputter deposition studies as well as some theoretical evaluations of the effect of thermo-optical parameter degradations is given. Selection criteria for the most suitable C.C. are resistance and transparency. To avoid failure of the GEOS satellite thermal control, the thermo optical surface properties have priority over the surface conductivity. C.C. candidate substrates were fused silica, Teflon-FEP, and Alfoil. As an alternative a multilayer coated surface is recommended, consisting of an Ag-layer on an Al-substrate, then a thin stripped A1203-coating for thermal control and finally an In203-coating. Author (ESRO)

N74-13598# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
A SPECTRUM ANALYZER USING A NETWORK WITH PERIODICALLY ENERGIZED SWITCHES [UN ANALIZZATORE DI SPETTRO REALIZZATO MEDIANTE RETI CONTENENTI INTERRUTTORI AZIONATI PERIODICAMENTE]
R. Orfei and G. V. Pallottino Feb. 1972 38 p refs In ITALIAN
(LPS-72-2) Avail: NTIS HC $4.00

A bandpass electric filter using RC networks with periodically energized switches in view of the Sirio Satellite interplanetary magnetic field spectrum analyser is presented. The bandpass lies between 20 Hz and 70 KHz divided into six-sub bands with an out of band attenuation of 40 db/decade. The filter transfer function leading to a symmetrical passband filter using two cascaded variable filters is detailed. The filter sensitivity and response to variation of parameters are discussed. The influence of the actual switches is detailed, together with the calculation of the duty cycle and switching frequency. Topics discussed in the experimental results include tests in harmonic regions, with input gaussian noise, and dynamic response. ESRO

N74-13599# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
STATE SPACE ANALYSIS OF NETWORKS CONTAINING PERIODICALLY OPERATED SWITCHES
R. Orfei and G. V. Pallottino Jul. 1972 75 p refs
(LPS-72-22) Avail: NTIS HC $5.75

A study of RLC networks with periodically operated switches is presented. The basic concept is that of resistance multiplication pertinent to the model of a resistor periodically switched with variable duty cycle aimed at slowing down the dynamics of a lumped linear time invariant network. A mathematical space state analysis of such networks with ideal switched was performed, and the transfer function of a two part network in steady state was determined subject to limitations which are detailed. The degrees of freedom and number of switches are discussed together with an error analysis on the effects of real switches and errors due to the continuous approximation of a discontinuously operated circuit. With a view to application to Sirio satellite interplanetary field measurement experiment, a variable filter for a spectrum analyser is presented and experimental results are discussed with regard to frequency range and bandpass. Other applications to integrated circuits with large time constants on swept analyses are outlined. ESRO

N74-13600# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
PLASMA-VEHICLE INTERACTIONS IN SPACE. SOME ASPECTS ON PRESENT KNOWLEDGE AND FUTURE DEVELOPMENT
U. Fahleson Dec. 1972 18 p refs Presented at the 6th European Space Lab. Symp. on Photon and Particle Interactions with Surfaces in Space. Noordwijk, Neth., 1972
(TRITA-EPP-72-35) Avail: NTIS HC $3.00

The charging of spacecraft by high energy electrons was found to constitute a serious problem to electric field and plasma measurements in the outer magnetosphere. The mechanism of charging was studied in some detail and it was concluded that for a vehicle with insulating surface, even the sunlit side may obtain a negative potential. The need for electrical cleanliness on future scientific spacecraft is stressed. This would involve control of spacecraft potential and of potentials outside a spacecraft by the use of surfaces with special photo and secondary emission properties, by conductive coating on all insulating surfaces exposed to plasma and, if necessary, also by active stabilization. Author (ERSO)

N74-13601# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
A REVIEW OF GEOSTATIONARY SATELLITE SCIENTIFIC DATA [RASSEGNA DI DATI SCIENTIFICI RELEVATI DA SATELLITI GEOSTAZIONARI]
Maurizio Candidi Oct. 1971 82 p refs In ITALIAN
(LPS-71-24) Avail: NTIS HC $6.25

A review of geosynchronous satellite borne instruments results in relation to magnetosphere parameter variation is presented. The main results stem from ATS-1 and ATS-5 satellites with references made to OGO-3, IMP-F, VELA 3A, and VELA 4A. The quiet and disturbed magnetosphere characteristics are discussed with regard to the magnetic field intensity and orientation and to particles, especially electrons and protons. Measurements performed by satellites under quiet conditions are detailed and correlation with theory is discussed. The magnetic storms and polar substorms are surveyed together with the oscillations of fields and fluxes, and their correlation. Data from satellites with regard to magnetic substorms and magnetospheric plasma during magnetic disturbances are presented. Other events, such as particle penetration inside the magnetosphere, violent double crossing of the magnetopause by ATS-1, and neutral sheath crossings, are outlined. ESRO

N74-13602# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
SOME INSTRUMENTAL EFFECTS OF THE S-202 SENSOR [STUDIO DI ALCUNI EFFETTI STRUMENTALI DEL SENSORE S-202]
F. Bordoni, P. Cerulli-Irelli, and L. Diodato Apr. 1973 25 p In ITALIAN
(LPS-73-12) Avail: NTIS HC $3.25

A test of the S-202 experiment onboard HEOS 2 satellite for instrumental effects is presented. The presence of proto-

electrons and photo-electrons is discussed and experimental tests are described. Test results are detailed and suitable modifications to eliminate the observed effects proposed. ESRO

N74-13603# Army Missile Command, Redstone Arsenal, Ala.
THE EFFECT OF WRAP-AROUND FINS ON AERODYNAMIC STABILITY AND ROLLING MOMENT VARIATIONS
C. W. Dahlke and J. C. Craft 20 Jul. 1973 55 p refs
(DA Proj. 1M2-62303-A-214)
(AD-767258; RD-73-17) Avail: NTIS CSCL 16/4

The report presents the results of an investigation of the effect of wrap-around fins on missile rolling moment coefficient. This investigation was conducted for four fin configurations at free stream Mach numbers ranging from 0.3 to 2.86. The wrap-around fin was found to have a self induced roll moment at zero angle of attack that varies with Mach number. This effect was studied for several fin geometric configurations for the static moment case. Comparisons between the moments caused by the fin cant and wrap-around fins are shown for the rolling case. Author (GRA)

N74-13604# Auburn Univ., Ala. Engineering Experiment Station.
DESIGN OF ADVANCED SAMPLED DATA CONTROL SYSTEMS Final Technical Report, 18 May 1972 - 17 Jul. 1973
Charles L. Phillips and Sherman M. Seltzer 17 Jul. 1973 111 p refs
(Contract DAAH01-72-C-0901)
(AD-767277) Avail: NTIS CSCL 16/4

The report contains the results of research into techniques for converting analog controllers (filters) to digital controllers, such that the characteristics of the control system remain essentially the same. A major consideration was to employ as low a sampling rate as possible in the digital controller. The control system considered throughout the report was the Pershing Weapons Systems roll-axis control system. First a technique developed by B. C. Kuo was considered. This technique yields excellent results at high sampling rates, with the results not as good as the sampling rate is decreased. Next various numerical integration techniques were investigated. Only the trapezoidal rule yielded good results at low sampling rates. Finally, various techniques developed for the design of digital filters were considered, with only the bilinear transform giving good results at low sampling rates. However, the bilinear transform is equivalent to the trapezoidal rule of numerical integration.
Author (GRA)

N74-13605# LTV Aerospace Corp., Warren, Mich.
FEASIBILITY DEMONSTRATION OF AN INFRARED TERMINALLY GUIDED SUBMISSILE, APPENDICES Final Report
31 Jul. 1973 113 p refs
(Contract DAAH01-71-C-0855)
(AD-767259; Rept-7-52100/73R-9-App) Avail: NTIS CSCL 17/7

Contents: Accounting of fabricated hardware; Drawing numerical list and telemetry drawing family tree; Advanced submissile preliminary engineering analysis; List of reports, procedures, and specifications; Parts breakdown list. GRA

N74-13606# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
THE DESIGN, FABRICATION, AND EVALUATION OF A RING WING CANARD CONTROL SYSTEM FOR A SHORT RANGE MISSILE
Joe S. Hunter 1 Aug. 1973 72 p refs
(DA Proj. 1M3-62302-A-214)
(AD-767533; RG-TR-73-16) Avail: NTIS CSCL 16/4

The report covers the ring wing canard control system from its initial design phase through a series of wind tunnel tests and into the present design improvement phase. The initial design used a low drift air bearing developed on an in-house gyro program. The gyro rotor was modified to interface with a ring wing air foil. Wind tunnel tests were conducted to determine the flow characteristics, center of pressure, nutation rate, precession rate, normal force coefficient, and pitching moment coefficient of the ring wing. The ring wing canard gyro control concept mechanizes a sensor controller to guide a missile without any requirements for inflight power, preflight power, electronics, or preconditioning. The design is of fire-and-forget technology as its control is completely self-contained. The simplicity of this design gives guided missile performance at slightly over free rocket cost. Author (GRA)

N74-13607*# North American Rockwell Corp., Seal Beach, Calif. Space Div.
SPACE TUG POINT DESIGN STUDY. VOLUME 1: SUMMARY Final Report
11 Mar. 1972 82 p
(Contract NAS7-200)
(NASA-CR-120109; SD72-SA-0032-Vol-1) Avail: NTIS HC $6.25 CSCL 22B

The design and characteristics of a space tug are discussed. The primary objective of the study is to verify the performance capability of a baseline design to deliver and retrieve payloads between 100 nautical miles, 28.5 degrees inclination, and geosynchronous. The space tug is ground based, reusable for 20 mission cycles, and is shuttled to and from low earth orbit by an earth orbital shuttle (EOS) with a 65,000 pound payload capability. It is shown that the baseline concept can meet the target performance goals. The design analysis encompassed: (1) definition of the vehicle primary structure, (2) thermal control, (3) meteoroid protection, (4) propulsion and mechanical subsystems, and (5) avionics including power generation and distribution. Author

N74-13608*# North American Rockwell Corp., Seal Beach, Calif. Space Div.
SPACE TUG POINT DESIGN STUDY. VOLUME 2: OPERATIONS, PERFORMANCE AND REQUIREMENTS Final Report
11 Feb. 1973 444 p
(Contract NAS7-200)
(NASA-CR-120110; SD72-SA-0032-Vol-2) Avail: NTIS HC $24.25 CSCL 22B

A design study to determine the configuration and characteristics of a space tug was conducted. Among the subjects analyzed in the study are: (1) flight and ground operations, (2) vehicle flight performance and performance enhancement techniques, (3) flight requirements, (4) basic design criteria, and (5) functional and procedural interface requirements between the tug and other systems. Author

N74-13609*# North American Rockwell Corp., Seal Beach, Calif. Space Div.
SPACE TUG POINT DESIGN STUDY. VOLUME 3: DESIGN DEFINITION. PART 1: PROPULSION AND MECHANICAL, AVIONICS, THERMAL CONTROL AND ELECTRICAL POWER SUBSYSTEMS Final Report
11 Feb. 1973 658 p
(Contract NAS7-200)
(NASA-CR-124023; SD72-SA-0032-Vol-3-Pt-1) Avail: NTIS HC $35.00 CSCL 22B

A study was conducted to determine the configuration and performance of a space tug. Details of the space tug systems are presented to include: (1) propulsion systems, (2) avionics, (3) thermal control, and (4) electric power subsystems. The data generated include engineering drawings, schematics, subsystem operation, and component description. Various options investigated and the rational for the point design selection are analyzed. Author

N74-13610*# North American Rockwell Corp., Seal Beach, Calif. Space Div.
SPACE TUG POINT DESIGN STUDY. VOLUME 3: DESIGN DEFINITION. PART 2: INSULATION, METEOROID PROTECTION, STRUCTURES, MASS PROPERTIES, GSE, RELIABILITY AND SAFETY Final Report
11 Feb. 1973 439 p
(Contract NAS7-200)
(NASA-CR-120111; SD72-SA-0032-Vol-3-Pt-2) Avail: NTIS HC $24.00 CSCL 22B

A study was conducted to determine the configuration and performance of a space tug. Detailed descriptions of the insulation, meteoroid protection, primary structure, and ground support

equipment are presented. Technical assessments leading to the concept selection are analyzed. The tug mass properties, reliability, and safety assessments are included. Author

N74-13611*# North American Rockwell Corp., Seal Beach, Calif. Space Div.
SPACE TUG POINT DESIGN STUDY. VOLUME 4: PROGRAM REQUIREMENTS Final Report
11 Feb. 1973 177 p refs
(Contract NAS7-200)
(NASA-CR-120112; SD72-SA-0032-Vol-4) Avail: NTIS HC $11.00 CSCL 22B

A study was conducted to determine the configuration of a space tug and to predict the performance parameters. The program plans and planning data generated in support of the tug development program are presented. The preliminary plans and supporting planning data emphasize the following requirements: (1) maintenance and refurbishment, (2) technology development, (3) production, (4) test facilities, (5) quality control, and (6) scheduling. Author

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-13612 Catholic Univ. of America, Washington, D.C.
STUDY OF MECHANICS OF STRESS RELAXATION IN VITREOUS SYSTEMS Ph.D. Thesis
Normand L. Laberge 1973 155 p
Avail: Univ. Microfilms Order No. 73-21102

An experimental investigation of stress relaxation mechanisms is reported for several vitreous systems. Two experimental techniques were used to obtain the desired results: the ultrasonic propagation of sound and strain relaxation. The ultrasonic measurement is used to determine the frequency and temperature dependence of the longitudinal modulus for glasses in their molten state. It has been shown from this investigation and from available light scattering data that the density fluctuation is the controlling mechanism in minimizing the total scattering loss. The strain relaxation data was determined by measuring the mid-point deflection of a centrally loaded beam as a function of time at a constant temperature near its glass transition region. The stress relaxation mechanism is determined by assuming a distribution of stress relaxation times that agrees acceptably well with the simulated strain relaxation data determined from the integration and Fourier analysis of this assumed distribution. Dissert. Abstr.

N74-13613 Arizona Univ., Tucson.
THE FERMI SURFACE OF CADMIUM UNDER PRESSURE Ph.D. Thesis
Howard Justin Bryant 1973 65 p
Avail: Univ. Microfilms Order No. 73-20672

Measurements of the effects of pressure on six of the extremal cross sectional areas S of the Fermi surface of cadmium are reported for pressures up to 25 bars. The de Haas-van Alphen effect was used at temperatures from 0.4 K to 1 K with magnetic fields from 7 to 26 kG to measure d(lnS)/dP for both the electron and hole sheets of the Fermi surface. Liquid He-4 cooled by He-3 refrigeration, was used as a pressure fluid. This high anisotropy demonstrates that pressure induced changes in the pseudopotential play an important role in the effects of pressure on the Fermi surface in this metal. Logarithmic pressure derivatives for the first band cap and second band monster hole sheets were measured under similar conditions. Some of the present measurements, however, are sufficiently accurate to deduce the relative logarithmic derivative of the cap-monster interaction with the AHL Brillouin Zone plane. Dissert. Abstr.

N74-13614 British Library Lending Div., Boston Spa (England).
THE WIND LOAD ON STRUCTURES
G. A. Savitskii 23 Jul. 1973 85 p refs Transl. into ENGLISH of the publ. "Vetrovaya Nagruzka na Sooruzheniya" Moscow, Lit. po Stroit., 1972
(BLL-Lib-Trans-1705-(5205.9)) Avail: British Library Lending Div., Boston Spa, Engl.: 9 BLL photocopy coupons

The effect of wind on structures is manifested as a static wind load together with dynamic oscillations. Knowing the design wind speed, the gustiness, the vertical velocity profile, the probability of winds if varying forces, and the wind directions, the effect of wind on a structure can be established. In view of the random nature of wind loads, an estimate of the calculated wind speed and an analysis of the effects of the gustiness can only be made on the basis of mathematical statistics. The wind load on structures also depends on the dimensions of the structure and the structural shape as it affects the aerodynamic coefficients. Author

N74-13615 British Library Lending Div., Boston Spa (England).
MECHANICAL BEHAVIOUR OF MATERIALS UNDER PRESSURE
H. Li. D. Pugh, ed. 5 Jul. 1973 13 p refs Transl. into ENGLISH from the book "Mekhanicheskie Svoistva Materialov Pod Vysokim Davleniem" Moscow, MIR, 1973 p 5-15
(BLL-NEL-TT-2498-(6075.461)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Tests were conducted to determine the behavior of materials when subjected to high pressures. Practical applications of the high pressure research in the hydrostatic extrusion of metals are discussed. The effect if pressure on the physico-mechanical properties of metallic materials and their structure is analyzed. The required equipment for conducting high pressure research projects is described. Author

N74-13616 British Library Lending Div., Boston Spa (England).
DETERMINATION OF THE NOTCHED IMPACE STRENGTH OF THERMOPLASTICS USING SMALL DRILLED STANDARD BARS
J. Pohrt [1973] 16 p refs Transl. into ENGLISH from Kunstoff-Rundschau (Hamburg-Rundschau), v. 57, no. 10, 1967 p 825-828 In ENGLISH and GERMAN
(BLL-M-23153-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Tests to determine the notched impact strength of thermoplastics with drilled instead of notched small standard bars were conducted. The approach was taken to avoid the splitting of highly oriented fibers. In addition, the presentation of impact bend strengths in relation to hole diameters provide more conclusive indications of the behavior of materials than is possible with the single point determinations. It is expected that the accuracy obtained the described method may result in revision of the classical testing methods. Each series of measurements was carried out on 50 standard bars of styrene, acrylonitrile copolymers, which were produced in a simple mold under uniform injection conditions. Author

N74-13617 British Library Lending Div., Boston Spa (England).
ON EXPERIMENTS WITH ENERGY ABSORBING IMPACT BODIES
[1973] 11 p refs Transl. into ENGLISH of Tech. Univ., Berlin, Inst. fuer Kraftfahrzeuge, report
(BLL-M-22811-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

Car bumpers were studied that absorb the kinetic energy of vehicle impacts in a manner that no deformation of the vehicle occurs. Foamed materials were investigated for their impact absorbing capacity. It is concluded that an elastic exterior skin of 2 to 4 mm thickness with inelastic inserted polyurethane foam fulfil the requirements of an energy dissipating system for impact speeds up to 4 m/s. F.O.S.

N74-13618 British Library Lending Div., Boston Spa (England).
THE INFLUENCE OF TEMPERATURE ON THE CREEP BUCKLING OF A CYLINDRICAL SHELL UNDER EXTERNAL PRESSURE
Heinz Bargmann 5 Jul. 1973 17 p refs Transl. into ENGLISH

from J. Mec. (Paris), v. 11, no. 4, Dec. 1972 p 561-577
(BLL-Risley-TR-2632-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

Creep and creep buckling of a long, thin-walled, circular cylindrical shell under external pressure was examined. The influence of time-varying and locally changing temperature is investigated. Elasticity as a deformation mechanism is considered. The basic equation is derived for the degree of deformation for time-varying external pressure and varying temperature. This equation describing the degree of deformation, called the characteristic deformation, gives the degree of strain at any time. Author

N74-13619 British Library Lending Div., Boston Spa (England).
DETERMINATION OF THE FORCE OF DEFORMATION OF PANELS WITH STIFFENING RIBS
V. P. Polukhin and E. V. Sigishov [1973] 14 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Chern. Met. (Moscow), no. 3, 1973 p 61-65 In ENGLISH AND RUSSIAN (BLL-M-21712-(5828.4F)) Avail: British Library Lending Div. Boston Spa, Engl.: 2 BLL photocopy coupons

A method for solving the problem of the three-dimensional flow of a thin layer of ductile stregthening material on elastically deformed surfaces was developed. The method was applied to determining the force of deformation of a panel of variable thickness of strengthening metals. The method was also used for hot pressing and extrusion force analysis. A specific example of the deformation of an aluminum panel is provided. Author

N74-13620 British Library Lending Div., Boston Spa (England).
MEASUREMENT OF CRITICAL CRACK DISPLACEMENT BY MEANS OF DOUBLE NOTCHED TEST PIECES
G. Pluvinage, M. Sabloniere, and F. Montariol 5 Jul. 1973 30 p Transl. into ENGLISH from Mem. Sci. Rev. Met. (Paris), v. 70, no. 1, 1973 p 61-71 In ENGLISH and FRENCH Presented at Journees Automne of the French Met. Soc., Oct. 1971
(BLL-Windscale-517-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The application of a doubly notched test piece to measurements of critical crack displacement is reported. The calculation and measurement of the crack displacement are discussed. A comparison of conventional techniques of crack displacement measurement with the double mark technique is prevented. The tenacity of steels was investigated as a function of various metallurgical parameters. F.O.S.

N74-13621 British Library Lending Div., Boston Spa (England).
EXPERIMENTS OF MATERIAL DAMPING IN FREE LONGITUDINAL VIBRATION
J. Szczygiel Oct. 1973 11 p refs Transl. into ENGLISH from Pr. Inst. Masz. Przeply. (Poland), v. 56, 1971 p 115-123 (BLL-RTS-8531) Avail: British Library Lending Div., Boston Spa, Engl.: £1.00; 3 BLL photocopy coupons

The problem is considered of measuring material damping by the method of free vibrations, under uniform and monoaxial stress. An apparatus is described for the excitation of free longitudinal vibrations in bars of circular cross-section. The test method and the results of trial measurements are also presented. Author

N74-13622 Rice Univ., Houston, Tex.
AN INVESTIGATION OF THE THERMODYNAMIC PERFORMANCE OF A DISCHARGING SPHERICAL PRESSURE VESSEL Ph.D. Thesis
Patrick Harris McKinney 1973 153 p
Avail: Univ. Microfilms Order No. 73-21579

A better understanding is provided of the thermodynamic performance of a discharging spherical pressure vessel in the reduced gravity environment of space. A numerical solution capable of simulating the laminar flow field and spatially varying thermodynamic properties within a discharging spherical vessel was developed. The method employed corresponds to a finite difference solution of the complete conservation equations for a viscous, conducting gas. A dimensionless solution is defined which applies to the special case of an ideal gas. A stability analysis is discussed which was obtained by numerical experimentation using a procedure based on previous theoretical work. Convergence of the solution is demonstrated. The accuracy of the numerical method is verified by a correlation with pressure variations within one of the Apollo 15 cyrogenic oxygen tanks during a high discharge rate experiment. Dissert. Abstr.

N74-13623 Engineering Sciences Data Unit, London (England).
STRESSES IN THE CORE OF A SANDWICH PANEL UNDER LOCAL NORMAL LOADING
Oct. 1973 9 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-73025) Copyright. Avail: Issuing Activity

Data for assessing the performance of sandwich panels subjected to a local loading remote from the panel edges are presented. The data relate to panels constructed from identical isotropic face plates with a core that has equal shear stiffness in all planes through its depth. The load is assumed to be axisymmetrically distributed over a small circular area of one face plate. Under loading the core is subjected to a combination of shear and compressive stresses. The maximum values of these stresses are provided in terms of the core and face plate properties and the dimensions for various values of the loading shape parameter. Author

N74-13624 Engineering Sciences Data Unit, London (England).
ESTIMATION OF THE LOCAL BUCKLING STRESS UNDER BIAXIAL COMPRESSION OF AN ISOTROPIC SKIN WITH FIBRE REINFORCED INTEGRAL UNFLANGED STIFFENERS
Nov. 1973 9 p Sponsored by Roy. Aeron. Soc.
(ESDU-73015) Copyright. Avail: Issuing Activity

The basic method for determining the local buckling stress of panels with unflanged integral stiffners is described. The effects of the buckle half wavelength, the longitudinal stresses, the transverse stresses, and the plate stiffness. The calculation procedure consists of a search for the wavelength that yields the minimum stress, which is considered the local buckling stress. Mathematical models are developed to show the distribution of applied loads between skin and stiffeners. Author

N74-13625 Engineering Sciences Data Unit, London (England).
STIFFNESSES OF AND STRESSES IN LAMINATED FLAT PLATES
Nov. 1973 18 p Sponsored by Roy. Aeron. Soc.
(ESDU-73032) Copyright. Avail: Issuing Activity

The formulas for the elastic analysis of the stresses and strains in plates built up from thin orthotropic layers are presented. The specimens have different material properties, thicknesses, and orientation of their principal axes of orthotropy. Mathematical models of the in-plane and flexural stiffness are developed. A method for the calculation of layer stresses when the plate is subjected to external loading is given. Author

N74-13626 Syracuse Univ., N.Y.
TENSILE FRACTURE UNDER HIGH PRESSURES AND HIGH STRAIN RATES Ph.D. Thesis
John Edward Biegel 1972 125 p
Avail: Univ. Microfilms Order No. 73-19788

The primary objective of this research was to determine the pressure - fracture strain relationship for materials tested under high pressures and at high strain rates. To do this, it was necessary to: (1) develop a test method, and (2) develop a method of analysis. The specimens were designed to give several initial configurations that resulted in several states of stress. The analysis was based on the critical volume strain failure criterion. Since neither pressure nor stress could be measured during the test, the stress was estimated from the hardness of the test specimen. The pressure at fracture was calculated from the stress at fracture and the strain at fracture under the critical volume strain fracture criterion. The Davidenkov-Spiridonova relationships for maximum longitudinal and radial stresses in a tension specimen were used to determine the principal stresses. Dissert. Abstr.

N74-13627 Texas A&M Univ., College Station.
A METHOD OF SUCCESSIVE ITERATIONS ON THE STATE

OF STRESS IN A HOMOGENEOUS ORTHOTROPIC AND THERMALLY EXCITED PLATE Ph.D. Thesis
Grenger Pei Yee Chang 1973 116 p
Avail: Univ. Microfilms Order No. 73-21651

A method of successive iterations to investigate the state of stress in a homogeneous, orthotropic, and thermally excited plate is presented which uses linearly exact expressions for the transverse variation of the displacement components. These displacement variations include separately the effects of transverse normal strain and transverse shear deformations. Three iterations were carried out in which the first iteration, First Order Plate Theory, is equivalent to the classical plate theory where plane stress and strain conditions are assumed. The second iteration, Second Order Plate Theory, incorporates only the plane stress condition thereby affording a better approximation than that of the first iteration. The third iteration, Third Order Plate Theory, relaxes all the conditions of the Kirchhoff hypothesis, thus giving a still better approximation. Dissert. Abstr.

N74-13628 Engineering Sciences Data Unit, London (England).
REFERENCE FREQUENCY OF PANEL WITH FLEXIBLE STIFFENERS
Jul. 1973 12 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-73013) Copyright. Avail: Issuing Activity

The reference frequency of initially unstressed flat, uniform, rectangular plates in a panel with flexible stiffeners is analyzed. The reference frequency is defined as the fundamental natural frequency, obtained from the model used to represent the panel, where an assumed mode shape has been employed in a Rayleigh-Ritz analysis. This frequency may be used as a first approximation to the fundamental natural frequency of the panel with edges fixed against rotation. The reference frequency is intended for use in calculating the stress response of panels with flexible stiffeners under the action of acoustic loading.
Author

N74-13629 Engineering Sciences Data Unit, London (England).
DAMPING IN ACOUSTICALLY EXCITED STRUCTURES
Jul. 1973 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-73011) Copyright. Avail: Issuing Activity

The effect of damping in defining the response of a structure to high intensity acoustic loading is discussed. The sources of damping in typical structures are described and information on the range of values to be found on different types of structure, without special damping values, has been devised. The damping is represented by two theoretical models, viscous and hysteretic. It is stated that the main sources of damping of structural response, with no artificial damping means, are structural where energy is dissipated in the form of heat, and acoustic, where the energy is dissipated from the structure as sound. Author

N74-13630 Engineering Sciences Data Unit, London (England).
THE ESTIMATION OF rms STRESS IN SKIN PANELS WITH FLEXIBLE STIFFENERS SUBJECTED TO RANDOM ACOUSTIC LOADING
Jul. 1973 30 p Sponsored by Roy. Aeronaut. Soc.
(ESDU-73014) Copyright. Avail: Issuing Activity

A method for estimating the root mean square stress in flat rectangular skin panels with flexible stiffeners under the action of random acoustic loading is presented. The configuration of the test specimen is illustrated. A mathematical model is provided to show the stress induced in the stiffened panel subjected to random acoustic loading on one side when only the fundamental natural mode is excited by the noise. The stress parameters for specimens of different configurations are shown in tables and graphs. Author

N74-13631 Engineering Sciences Data Unit, London (England).
ENDURANCE OF TITANIUM AND TITANIUM ALLOY STRUCTURAL ELEMENTS SUBJECTED TO SIMULATED ACOUSTIC LOADING
Apr. 1973 14 p Sponsored by Roy. Aeronaut. Soc.
(ESDU-73010) Copyright. Avail: Issuing Activity

Fatigue tests on titanium alloys specimens, typical of aircraft structural elements, excited by narrow-band loading of random amplitude were conducted. The tests simulated the stress response to acoustic loading. The tests results are grouped according to the type of structural element, material, and method of attachment. Data are presented in the forms of tables and graphs. Descriptions of the test methods and the specimens are included. Author

N74-13632 Engineering Sciences Data Unit, London (England).
INTRODUCTORY NOTES ON FATIGUE CRACK PROPAGATION IN THIN SHEET MATERIALS
Oct. 1973 9 p refs Supersedes ESDU-Fat-A.06.01 Sponsored by Roy. Aeron. Soc.
(ESDU-73020; ESDU-Fat-A.06.01) Copyright. Avail: Issuing Activity

Concepts of fracture mechanics for analyzing the growth of cracks in thin sheet material under fatigue loading were investigated. The method is based on the use of stress intensity at the crack tip and provides a concise method of presenting fatigue crack propagation data. The basic equations are stated and the limitations of the fracture mechanics analysis are described. Description of the stages and modes of crack growth are included. Author

N74-13633# National Aerospace Lab., Amsterdam (Netherlands).
FATIGUE CRACK GROWTH IN ALUMINUM ALLOY SHEET MATERIAL UNDER FLIGHT-SIMULATION LOADING. EFFECTS OF DESIGN STRESS LEVEL AND LOADING FREQUENCY
J. Schijve, F. A. Jacobs, and P. J. Tromp Feb. 1972 26 p refs
(NLR-TR-72018-U) Avail: NTIS HC $3.25

Specimens of 2024-T3 and 7075-T6 were tested at 10, 1 and 0.1 cps. Values of mean stress in flight were 10.0, 8.5, 7.0, 5.5 and 4.0 kg/sq mm. The analysis of the results considers the frequency effect and its significance for inspection periods in service, and the effect of stress level. A comparison between the two alloys, the prediction of crack rates in flight-simulation tests, and the meaning of the stress intensity factor for the latter purpose are included. Author

N74-13634*# Boeing Commercial Airplane Co., Seattle, Wash.
BUCLAP2: A COMPUTER PROGRAM FOR INSTABILITY ANALYSIS OF LAMINATED LONG PLATES SUBJECTED TO COMBINED INPLANE LOADS. USER'S MANUAL
David W. Halstead, L. L. Tripp, M. Tamekuni, and L. L. Baker
Aug. 1973 81 p refs
(Contract NAS1-11879)
(NASA-CR-132298; D6-60187) Avail: NTIS HC $6.25 CSCL 20K

The usage of the computer program BUCLAP2 is described. The program is intended for linear instability analysis of long, rectangular flat and curved laminated plates with arbitrary orientation of orthotropic axes in each layer. The loadings considered are combinations of inplane normal and shear loads. Arbitray elastic boundary conditions are included for the sides of the plate Instructions for use of the program are included along with Input data requirements, output information, and sample problems. For program description, see N74-13635.
Author

N74-13635*# Boeing Commercial Airplane Co., Seattle, Wash.
BUCLAP2: A COMPUTER PROGRAM FOR INSTABILITY ANALYSIS OF LAMINATED LONG PLATES SUBJECTED TO COMBINED INPLANE LOADS Program Description Document
David W. Halstead, L. L. Tripp, M. Tamekuni, and L. L. Baker
Aug. 1973 96 p refs
(Contract NAS1-11879)
(NASA-CR-132299) Avail: NTIS HC $7.00 CSCL 20K

This program description document describes the program structure and the design details of a CDC 6600 FORTRAN 4 digital computer program, BUCLAP2, which uses minimum energy principles to do an elastic stability analysis of curved and flat laminated rectangular long plates subjected to combined inplane normal and shear loads. Given the geometry, the material

properties, and slected boundary conditions for the plate element, the program calculates the minimum buckling load for various wave lengths. The two parallel ends of the program calculates the minimum buckling load for various wave lengths. The two parallel ends of the long plate must be simply supported and arbitrary elastic boundary conditions may be impossd along either one or both external longitudinal sides. For guide to program use, see N74-13634 Author

N74-13636*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A COMPUTER PROGRAM FOR AUTOMATED FLUTTER SOLUTION AND MATCHED POINT DETERMINATION

Kumar G. Bhatia Washington Dec. 1973 57 p refs
(NASA-TM-X-2846; L-9128) Avail: NTIS HC $3.50 CSCL 09B

The use of a digital computer program (MATCH) for automated determination of the flutter velocity and the matched-point flutter density is described. The program is based on the use of the modified Laguerre iteration formula to converge to a flutter crossing or a matched-point density. A general description of the computer program is included and the purpose of all subroutines used is stated. The input required by the program and various input options are detailed, and the output description is presented. The program can solve flutter equations formulated with up to 12 vibration modes and obtain flutter solutions for up to 10 air densities. The program usage is illustrated by a sample run, and the FORTRAN program listing is included. Author

N74-13637*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

COMPARISON OF FINITE-DIFFERENCE SCHEMES FOR ANALYSIS OF SHELLS OF REVOLUTION

Ahmed K. Noor (George Washington Univ.) and Wendell B. Stephens Washington Dec. 1973 44 p refs
(NASA-TN-D-7337; L-8898) Avail: NTIS HC $3.00 CSCL 20K

Several finite difference schemes are applied to the stress and free vibration analysis of homogeneous isotropic and layered orthotropic shells of revolution. The study is based on a form of the Sanders-Budiansky first-approximation linear shell theory modified such that the effects of shear deformation and rotary inertia are included. A Fourier approach is used in which all the shell stress resultants and displacements are expanded in a Fourier series in the circumferential direction, and the governing equations reduce to ordinary differential equations in the meridional direction. While primary attention is given to finite difference schemes used in conjunction with first order differential equation formulation, comparison is made with finite difference schemes used with other formulations. These finite difference discretization models are compared with respect to simplicity of application, convergence characteristics, and computational efficiency. Numerical studies are presented for the effects of variations in shell geometry and lamination parameters on the accuracy and convergence of the solutions obtained by the different finite difference schemes. On the basis of the present study it is shown that the mixed finite difference scheme based on the first order differential equation formulation and two interlacing grids for the different fundamental unknowns combines a number of advantages over other finite difference schemes previously reported in the literature. Author

N74-13638*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

VIEW FACTOR COMPUTER PROGRAM (PROGRAM VIEW) USER'S MANUAL

Edward F. Puccinelli Jul. 1973 127 p
(NASA-TM-X-70538; X-324-73-272) Avail: NTIS HC $8.50 CSCL 20K

The purpose of program VIEW is to compute view factors between specified surfaces and to be compatible with level 15.5 of the NASTRAN structural analysis program. Program VIEW is a modification of a (finite element) view factor computation program called RAVFAC. VIEW is designed to run on an IBM System/360 operating under OS (operating system), with a minimum region size of 110 K bytes. The actual computation of view factors is still performed exactly as it was in the original version of RAVFAC. In developing VIEW, RAVFAC was modified to satisfy the following compatibility requirements: (1) accept finite element input which can also be used as input to NASTRAN, (2) produce output (view factors) in a format which can be used as input to NASTRAN, and (3) follow NASTRAN program design so that in the future VIEW can be incorporated into NASTRAN as a subroutine. The VIEW program permits computation of the view factors between surfaces, taking into account the presence of any intermediate surfaces. VIEW also computes these view factors either by contour integration or by finite difference (double summation) methods. Author

N74-13639# Lockheed Missiles and Space Co., Palo Alto, Calif.

ON SHOCKWAVE PROPAGATION IN AN ELASTIC MEDIUM UNDER PLANE FINITE STRAIN

A. A. Burenin, Nguen Khyu Tkhan, and A. D. Chernyshov [1973] 6 p refs Transl. into ENGLISH from PMM (USSR), v. 37, no. 5, 1973 p 900-904
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

Shock wave propagation conditions in an elastic medium under plane finite strain are investigated. The velocities of the possible shock waves are found from the solution of the system of equations in jumps on the shocks. Conditions for the existence of shocks are obtained by using the second law of thermodynamics on the surface of discontinuity. The elastic medium is considered to be incompressible. Mathematical models are developed to explain the performance of the shock waves. Author

N74-13640# Lockheed Missiles and Space Co., Palo Alto, Calif.

ON THE DETERMINATION OF THE IMPULSIVE FORCES AND MOMENTS COMMUNICATED BY SHOCKS TO BODIES OF REVOLUTION

V. A. Kazakov [1973] 5 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (Moscow), no. 4, 1973 p 186-190
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Illinois 60616

The effects of impulse forces and moments on bodies of revolution from supersonic air flow are discussed. The spatial problem of the nonstationary flow around a body of revolution moving at supersonic velocity is considered when a moving weak shock is incident on the body. The stream parameters behind the weak shock are considered constant. The total impulsive forces and moments during the whole time of the nonstationary process are determined. Mathematical models are developed to define the conditions under various types of flow. Author

N74-13641# Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.

LOW-CYCLE FATIGUE RESULTS FOR SPOT-WELDED AISI 316 STAINLESS STEEL STRIP AT ELEVATED TEMPERATURES

P. N. Flagella and R. Hundal 1972 30 p refs Presented at Intern. Conf. on Creep and Fatigue in Elevated Temp. Appl., Philadelphia, 23 Sep. 1973
(Contract AT(11-1)-3045)
(Conf-730916-1) Avail: NTIS HC $3.00

Spot-welded samples of AISI 316 stainless steel were tested in air at room temperature, 1000, 1150, and 1300 F. Tensile testing was conducted in a Baldwin tensile machine and load-cycle fatigue testing was conducted in a MTS fatigue machine. The creep-rupture testing was conducted at 1150 F in air. Fatigue tests at different cycle frequencies as well as hold-time in tension only were conducted at 1150 F in the MTS fatigue machine and the set up was identical to that used for the constant cycle fatigue testing. Limited relaxation testing was also conducted in the MTS fatigue machine at 1150 F. Correlations of the experimental results for the spot-welded strip are discussed. The fact that the tests involving hold-time in tension correlates with the creep rupture life (one cycle) suggests a possible creep-fatigue interaction. Author (NSA)

N74-13642# Technische Universitaet, Brunswick (West Germany). Inst. fuer Statik.

CONTINUUM CALCULATION FROM ELASTIC PLASTIC

REINFORCED MATERIAL USING A FINITE ELEMENT METHOD Ph.D. Thesis - Brunswick Univ. [DIE BERECHNUNG VON KONTINUA AUS ELASTISCH-PLASTISCHEM MATERIAL MIT VERFESTINGUNG NACH EINER FINITEN ELEMENTMETHODE]

Hans Eggers 1972 110 p refs In GERMAN
(Rept-72-3) Avail: NTIS HC $7.50

Based on the Prandtl/Reuss law of matter, the Mises flow conditions, and the Hellinger/Reissner energy principle, continuum calculations of plasticized elastic matter using a finite element method variant were carried out. The mathematical method was tested on a stretch loaded bar and an internally pressurized circular cylindrical shell of indefinite length as a one dimensional example and a stretch loaded circular disk as a two dimensional example. Extension of the method to include membrane shells and flexurally stiff flat support structures is also considered. ESRO

N74-13643# Technische Universitaet, Brunswick (West Germany). Inst. fuer Statik.

COMPUTATION OF SHELLS WITH FINITE DISPLACEMENTS: MIXED FINITE ELEMENTS [BERECHNUNG VON SCHALEN MIT ENDLICHEN VERSCHIEBUNGEN: GEMISCHTE FINITE ELEMENTE]

Rudolf Harbord 1973 147 p refs In GERMAN Sponsored by the Deut. Forschungsgemeinschaft
(Rept-72-7) Avail: NTIS HC $9.50

Numerical finite element calculations on thin elastic shell supporting systems were carried out, using finite displacements. The stress displacement variation equation used adapted the linear increment method. Finite transformation with bilinear functions produces a mixed element model with nine free values per element node. The applicability of this model was tested with examples from the linear plate and shell theory. It was shown that better results are obtained with quadrangular elements than with triangular elements. Geometrical nonlinearity calculations were carried out on a transversally loaded steel sheet. The load carrying capacity of plates and shells under stress was investigated. ESRO

N74-13644# Technische Universitaet, Brunswick (West Germany). Inst. fuer Statik.

A FINITE ELEMENT METHOD FOR RANDOM FOLDED PLATE STRUCTURES [EINE FINITE-ELEMENT-METHODE ZUR BERECHNUNG BELIEBIGER FALTWERKE]

Galal Abdel-HamidAbdellah 1973 81 p refs In GERMAN Partly sponsored by the Egypt. Govt. and the Deut. Forschungsgemeinschaft
(Rept-73-10) Avail: NTIS HC $6.25

A numerical finite element method with the following characteristics was developed: triangular elements; three displacement and three rotation values per nodal point, a first degree polynom for each of the six unknowns; unambiguous transformations; the boundary conditions expressed in physical values; and the stiffness matrixes. The method was applied to a continuous prismatic folded plate structure, a folded structure barrel, a shed roof construction, and a silo funnel calculation. ESRO

N74-13645# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.

VIBRATIONS OF HARMONIC OSCILLATORS AND THERMAL NOISE ANALYSIS

S. Cantarano and F. Palutan Mar. 1973 53 p refs
(LPS-73-7) Avail: NTIS HC $4.75

The response of a classical harmonic oscillator and of a system of two mechanically coupled oscillators under various types of externally induced excitation was investigated. Analytical and numerical methods were employed for the solution of the equations of motion. The analytical solution was obtained for the free oscillation case and for the simplest type of excitation function, while the numerical method permits obtaining the response of two oscillators for the most general type of excitation. The study was conducted with the intent of investigating, with a first order approach, the response of a cylinder used as a gravitational wave detector. The effect of noise introduced by the electronics connected to the detector for signal amplification, and the optimum bandwidth, and therefore the achievable time resolution, was computed. ESRO

N74-13646# Washington Univ., Seattle. Dept. of Mechanical Engineering.

A SIMPLE PROCEDURE FOR ESTIMATING STRESS INTENSITY FACTOR IN REGION OF HIGH STRESS GRADIENT Interim Technical Progress Report no. 1

Albert S. Kobayashi Sep. 1973 26 p refs Presented at US-Japan Seminar on the Significance of Defects in Welded Struct. Tokyo, 15-19 Oct. 1973, sponsored by NSF and Japan Soc. for the Promotion of Sci.
(Grant DA-ARO(D)-31-124-73-G38)
(AD-767404; ITR-1) Avail: NTIS CSCL 20/11

Simple procedures for estimating stress intensity factors of through-cracks and semi-elliptical cracks in regions of high stress gradient have been presented. Stress intensity factors for cracks emanating from an unfilled hole, an interference fitted hole, a hole with a concentrated load, and on the external and internal surfaces of a pressurized cylinder, were determined by these procedures. These procedures should be of practical interest for engineers involved in day-to-day problems in fracture mechanics. Author (GRA)

N74-13647# Illinois Univ., Urbana. Dept. of Civil Engineering.

USE OF NONCONFORMING MODES IN FINITE ELEMENT ANALYSIS OF PLATES AND SHELLS

Chang-Koon Choi and William C. Schnobrich Sep. 1973 125 p refs
(Contract N00014-67-A-0305-0010)
(AD-767169; SRS-401; UILU-ENG-73-2019) Avail: NTIS CSCL 20/11

The development of another finite element is presented in the study. By adding nonconforming displacement modes selectively to the low order isoparametric elements, highly improved new shell elements are established. Addition of various combinations of nonconforming modes to the original elements has been investigated and the elements, both linear and quadratic, which have two nonconforming modes added to the inplane displacements, four to the out-of-plane displacement and no additional modes to rotations have been found to be most effective in terms of the number of nonconforming modes used versus the improvement obtained. These elements have been tested with deep beam, plate, and various shell problems. Cylindrical, elliptic paraboloid, spherical and conoidal shells were investigated in order to demonstrate the versatility of newly developed nonconforming elements. The results obtained from these investigations compare favorably with the results from well-established analyses. The improvement incorporated into the four-node element is impressive. Author (GRA)

N74-13648# Illinois Univ., Urbana. Dept. of Civil Engineering.

FINITE ELEMENT ANALYSIS OF INTERSECTING CYLINDERS

S. A. Bakhrebah and W. C. Schnobrich Sep. 1973 146 p refs
(Contract N00014-67-A-0305-0010)
(AD-767168; UILU-ENG-73-2018; SRS-400) Avail: NTIS CSCL 20/11

Two and three-dimensional isoparametric nonconforming finite elements are developed and adapted to the shell intersection problem. Two-dimensional elements model the shells away from the intersection region while three-dimensional elements are used right at the intersection. A transition element connects these two dissimilar elements. In addition to plane, plate, and shell standard test problems, the procedure is also applied to normally intersecting cylinders of near-equal diameters. Comparison is made between computed results and those obtained from careful experiments. The excellent agreement between the results of the two procedures is demonstrated. Author (GRA)

N74-13649# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.

LARGE AMPLITUDE WAVES IN BOUNDED MEDIA. 2: THE INITIAL DEFORMATION OF AN IMPULSIVELY LOADED SLAB

Y. Kazakia and E. Varley Sep. 1973 130 p refs
(Contract DAAD05-71-C-0389)

(AD-767264; CAM-140-4; BRL-CR-119) Avail: NTIS CSCL 20/11

The paper continues the investigation of large amplitude waves in bounded media started by H. M. Cekirge and E. Varley (1973). It describes the early stages of the deformation produced in an elastic slab contained between two parallel, plane interfaces when the normal traction at one of them changes discontinuously. During the subsequent deformation energy is radiated across these interfaces to adjacent elastic materials. The disturbance in the slab could be caused by the arrival of a constant strength shock wave traveling through an adjacent material or when the slab, which forms part of a composite material, impacts some other elastic material. It is assumed that the dynamic response of the slab can be approximated by that of one of the model materials introduced in the first part of this study. It is shown that this is possible for a whole host of materials. These include polycrystalline solids, metals when subjected to high pressure, water, explosive products, gases and yarns as well as elastic-plastic, rigid-plastic and rigid-elastic materials. (Modified author abstract) GRA

N74-13650# Army Foreign Science and Technology Center, Charlottesville, Va.

THE DEFORMATION THEORY OF THERMOPLASTICITY

V. S. Lenskii and V. A. Lomakin 11 Apr. 1973 15 p refs Transl. into ENGLISH from Tepl. Napryazh. Elementakh Konstrukt. (USSR), 1970 p 37-51

(AD-767148; FSTC-HT-23-2320-72) Avail: NTIS CSCL 20/12

A study of the foundation of the deformation theory of thermoplasticity is given which considers the functional relationship between mechanical properties of the medium and temperature. GRA

N74-13651# Massachusetts Univ., Amherst. School of Engineering.

EXPERIMENTAL DETERMINATION OF STRAIN CONCENTRATIONS NEAR AN UNREINFORCED HOLE IN ORTHOTROPIC SHELLS

Charles F. Scribner and William A. Nash Jul. 1973 60 p refs (Contract N00014-68-A-0146-0016)

(AD-767046; UM-73-7) Avail: NTIS CSCL 11/4

Research was conducted in the University of Massachusetts Structural Mechanics Laboratory to determine the character of stress concentrations around an unreinforced hole in cylindrical orthotropic shell sections. The report discusses construction and instrumentation of these sections with consideration of various systems of strain measurement, described the equipment used in tests, and discusses the data obtained from strain gages epoxied to the surface of three specimens. Qualitative conclusions are drawn relating the behavior of this material to the behavior of isotropic materials and a similar glass-reinforced material with different fiber orientation. Author (GRA)

N74-13652# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

BUCKLING OF CYLINDRICAL SHELLS WITH AXISYMMETRIC TOROIDAL INITIAL IMPERFECTIONS Final Report, Jan. 1969 - Apr. 1970

Clark E. Beck Jul. 1973 57 p refs

(AF Proj. 1347)

(AD-767589; AFFDL-TR-73-81) Avail: NTIS CSCL 20/11

Some recent advances in thin shell buckling theory which tend to explain the discrepancy between experiment and theory are reviewed. The results of a digital computer study to determine the effect of three discrete axisymmetric imperfections on the buckling load of two specific circular cylindrical shells are presented and discussed. The shells were 40 inches long with wall thicknesses of 0.02 inch and radii of five and ten inches. Initial imperfection amplitudes considered were 0.005, 0.01 and 0.02 inch. Author GRA

N74-13653# Notre Dame Univ., Ind. Coll. of Engineering.

DYNAMIC ANALYSIS OF CRACKED NAVAL VESSELS

R. F. Hegarty and T. Ariman Sep. 1973 73 p refs (Contract N00014-68-A-0152; NR Proj. 260-112)

(AD-767329; UND-73-10) Avail: NTIS CSCL 13/10

The report deals with the dynamic response of a thin finite, elastic circular cylindrical shell representing a naval vessel to time-dependent loadings symmetric with respect to the axis of the cylinder. The shell contains an axial through crack of length 2c. The dynamic counterpart of Donnell's shallow shell equations are used in this investigation. Extensive numerical results are presented for stress intensity factors in aluminum and steel vessels and results are discussed. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-13654 British Library Lending Div., Boston Spa (England).

A THERMODYNAMIC METHOD OF DETERMINING THE DROPLET CONTENT OF MOISTURE LADEN AIR

C. Chiniara 5 Jul. 1973 29 p refs Transl. into ENGLISH from Brennst.-Waerme-Kraft (West Germany), v. 25, no. 2, Feb. 1973 p 31-38

(BLL-CE-Trans-6208-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

An instrument for the determination of the droplet content in wet air is described. It works on the principle of the throttling calorimeter, and is used for finding the discharge of droplets from cooling towers. The theory of the instrument is described, as well as the results of systematic testing on a rig in which wet air of defined composition can be produced. Author

N74-13655 British Library Lending Div., Boston Spa (England).

A COMPUTER ORTHOGONALISATION METHOD FOR CONSTRUCTING A NONLINEAR MATHEMATICAL MODEL OF AN OBJECT FROM EXPERIMENTAL DATA

A. Kapustinskas, A. Nemura, and A. Nenorta [1973] 9 p refs Transl. into ENGLISH from Lietuvos TSR Mokslu Akad. Darbai: Ser. B (Vilnius), v. 66, no. 3, 1971 p 215-224

(BLL-M-22898-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 1 BLL photocopy coupon

A computer method of constructing equations of state from experimental thermodynamic data was developed. A disadvantage of the proposed method is described and a method for improving the accuracy of the analysis is presented. Specific reference is made to the problem of obtaining a system of orthonormal polynomials for a given system of values of the arguments of a multivariate domain. Mathematical models of the multivariate objects are included. Author

N74-13656 British Library Lending Div., Boston Spa (England).

FORCED CONVECTION HEAT TRANSFER TO SUPERCRITICAL HELIUM

H. Ogata and S. Sato 27 Dec. 1973 15 p refs Transl. into ENGLISH from Teion Kogaku (Sapporo), v. 7, no. 1, 1972 p 20-28

(BLL-CE-Trans-6126-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

This report presents the treatment and prediction of physical data required for an analysis of heat transfer results of measurements of heat transfer by heat engineering techniques in the range of temperature 4.2 - 11 K, pressure 2-15 atm (abs), and heat flux 0-1.1 W/sq cm. Author

N74-13657 British Library Lending Div., Boston Spa (England).

THE PROBLEM OF CORROSION DAMAGE BY GASES FROM BURNING P.V.C.

K. Fischer 3 Sep. 1973 13 p Transl. into ENGLISH from Z. VFDB (West Ger.), v. 4, 1971 p 140-144

(BLL-Lib-Trans-1768-(5205.9)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The problem of corrosion damage by combustion gases from

fires involving polyvinyl chloride is reported. Emphasis is placed on possible damage to building materials and building components. The area of corrosion extends from the disturbance of sensitive electronic equipment and apparatus by combustion gases to corrosion of bare metallic parts of heavy machinery. The specific effects produced by the components of the polyvinyl chloride exhaust products are analyzed. Author

N74-13658 British Library Lending Div., Boston Spa (England).

SUPERCRITICAL HELIUM GAS COOLING

H. Yonemitsu Dec. 1973 31 p refs Transl. into ENGLISH from Teion Kagaku (Sapporo), v. 4, no. 6, 1969 p 247-264

(BLL-RTS-8638) Avail: British Library Lending Div., Boston Spa, Engl.: £3.00; 10 BLL photocopy coupons

The properties of super critical helium are discussed with special emphasis on the heat transfer properties. The test equipment and the method of conducting the experiments are presented. It is stated that the heat transfer coefficient varies as a function of the Reynolds number and Prandtl number in the forced cooling of pressurized cold helium gas, and in direct proportion to the Grashof number in free convection. Mathematical models are developed to analyze the thermodynamic properties of the helium gas. Author

N74-13659 British Library Lending Div., Boston Spa (England).

CONVECTIVE HEAT TRANSFER FROM A SPHERE IN STILL AIR

K. Yamagata Dec. 1973 26 p refs Transl. into ENGLISH from Nippon Kikai Gakkai Rombunshu (Japan), v. 37, no. 9, 1943 p 132-138

(BLL-RTS-8440) Avail: British Library Lending Div., Boston Spa, Engl.: £2.50 or 8 BLL photocopy coupons

Heat transfer by free convection between a sphere at high temperature and air was investigated. It was determined that the average Nusselt number for the system is a function of the Grashof number. A mathematical model is developed to prove that the Nusselt number will adopt a limiting value of 2 as the Grashof number approaches zero. The conditions under which the experiments were conducted are described. It was determined that for the range in which the boundary layer can be considered thin and laminar, the behavior generally paralled the theoretical curve, but the Nusselt number was found to be ten percent higher than predicted. Author

N74-13660 British Library Lending Div., Boston Spa (England).

SOME FORMULAE OF INCREASED PRECISION FOR CALCULATING THE HEAT TRANSFER AND AIR RESISTANCE OF BANKS OF HEAT EXCHANGER TUBES WITH WIRE FINS

S. N. Tulin Sep. 1973 8 p refs Transl. into ENGLISH from Energomashinostroenie (USSR), v. 3, 1971 p 31-33

(BLL-RTS-8453) Avail: British Library Lending Div., Boston Spa, Engl.: £0.70; 2 BLL photocopy coupons

A numerical analysis of the heat transfer and air resistance characteristics of banks of heat exchanger tubes with wire fins was conducted. The effects of pitch on the heat transfer tubes with ribbon fins were investigated. It was found that the specific pitch of the tubes in the array had a marked effect on the heat transfer. Over the range of specific pitches investigated, using staggered tube arrays, the heat transfer varied by 60 percent and the aerodynamic resistance varied by 50 percent. Mathematical models are included to analyze the performance of the heat exchangers. Author

N74-13661 Missouri Univ., Columbia.

HEAT AND MASS TRANSFER FROM AN EVAPORATIVE SURFACE IN A POROUS MEDIUM TO AN EXTERNAL AIR STREAM Ph.D. Thesis

Chung Poon Tsai 1972 130 p

Avail: Univ. Microfilms Order No. 73-21840

An analysis was performed of steady-state heat and mass transfer between a submerged evaporative interface in a porous medium and an external gas stream. The theoretical model divides the porous bed into three zones: an air-penetrated turbulent layer at the top of the bed, a stagnant buffer layer, and a liquid-saturated layer below the evaporative surface. The first two of these layers are liquid-free. Evaporation rate is correlated to the distance, pi, between the evaporative surface and the surface of the porous medium; the depth, delta, of turbulent air penetration; and the effective thermal conductivity of the buffer layer of the porous medium. The effective thermal conductivity characterizes heat transfer both by convection and conduction within the buffer layer. The present theory differs from previous treatment in that the assumption of a boundary layer along the surface of the porous medium is abandoned because such a boundary layer exists only at very small air velocity.

Dissert. Abstr.

N74-13662 Engineering Sciences Data Unit, London (England).

CONVECTIVE HEAT TRANSFER DURING CROSS FLOW OF FLUIDS OVER PLAIN TUBE BANKS

Nov. 1973 28 p refs Sponsored by Inst. of Chem. Engr. and Inst. of Mech. Engr.

(ESDU-73031) Copyright. Avail: Issuing Activity

Convective heat transfer for the crossflow of a fluid over tube banks of circular cylinders under conditions of negligible thermal radiation and zero heat generation within the fluid is reported. The data are presented in nondimensional form and are valid for the crossflow of a single-phase Newtonian fluid. This includes most normal liquids and gases. In applying the data to the heating of liquids, the temperature of the tube outside surface at all points in contact with the liquid must be less than the saturation temperature for the liquid concerned. Data averaged for a complete bank of tubes are presented, and the variations, in heat transfer from row to row are considered. A number of other factors are considered that may influence convective heat transfer. The methods presented are expected to yield heat transfer coefficients accurate to within about + or - 15 per cent over most of the Reynolds number range. The derivation and accuracy of the data in greater detail is discussed. A summary of the calculation procedure is given. Author

N74-13663*# TRW Systems Group, Redondo Beach, Calif. Materials Science Staff.

USER'S MANUAL FOR THE TRW GASPIPE 2 PROGRAM: A VAPOR-GAS FRONT ANALYSIS PROGRAM FOR HEAT PIPES CONTAINING NON-CONDENSIBLE GAS

D. K. Edwards, G. L. Fleischman, and B. D. Marcus Oct. 1973 128 p refs

(Contract NAS2-5503)

(NASA-CR-114672; TRW-13111-6054-R0-00) Avail: NTIS HC $8.50 CSCL 20M

A digital computer program for design and analysis of heat pipes which contain non-condensible gases, either for temperature control or to aid in start-up from the frozen state, is presented. Some of the calculations which are possible with the program are: (1) wall temperature profile along a gas-loaded heat pipe, (2) amount of gas loading necessary to obtain desired evaporator temperature at a desired heat load, (3) heat load versus evaporator temperature for a fixed amount of gas in the pipe, and (4) heat and mass transfer along the pipe, including the vapor-gas front region. Author

N74-13664*# Martin Marietta Corp., Baltimore, Md. Chemistry Dept.

EXPLOSIVES AND PYROTECHNIC PROPELLANTS FOR USE IN LONG TERM DEEP SPACE MISSIONS

Carl S. Gorzynski, Jr. and J. Norman Maycock 17 Aug. 1973 31 p refs Backup document for AIAA Synoptic scheduled for publication in the Journal of Spacecraft and Rockets, Apr. 1974

(Contract NAS1-10698)

(NASA-CR-132373) Avail: NTIS HC $3.75 CSCL 19A

Explosives and pyrotechnic propellant materials which will withstand heat sterilization cycling at 125 C and ten year deep space aging under 10 to the minus 6th power torr and 66 C have been selected. The selection was accomplished through a detailed literature survey and an analytical evaluation of the physicochemical properties of the materials. The chemical components of the electroexplosive devices used in U.S. missiles and spacecraft were categorized into primary explosives, secondary explosives, and propellant ingredients. Kinetic data on such parameters as thermal decomposition and sublimation were

obtained for these materials and used as a basis for the ten year life prediction. From these experimental data and some analytical calculations, a listing of candidate materials for deep space missions was made. Author

N74-13665*# Brunswick Corp., Marion, Va. Technical Products Div.
INVESTIGATION OF LOW-COST FABRICATION OF ABLATIVE HEAT SHIELDS Final Report
V. P. Massions and R. W. Mach 28 Dec. 1973 93 p ref
(Contract NAS1-10864)
(NASA-CR-112312; BC-8838-FR) Avail: NTIS HC $6.75 CSCL 13A

The fabrication, testing, and evaluation of materials and techniques employed in the fabrication of ablative heat shield panels are described. Results of this effort show projected reductions in labor man-hours for dielectric curing of panels when compared to panels molded in a steam-heated press. In addition, panels were fabricated with more than one density within the cross-section. These dual-density panels show significant weight and cost reduction potentials. Author

N74-13666# Research Inst. of National Defence, Sundbyberg (Sweden).
THE EFFECT OF A REFINING DEVICE ON THE EXHAUST GASES FROM A DIESEL VEHICLE [REINGSANORDNINGS PAVERKAN PA AVGASEMISSIONEN FRAN DIESELFORDON]
Harald Frostling Nov. 1971 15 p In SWEDISH
(FOA-1-C-1429-C4) Avail: NTIS HC $3.00

A measurement has been made of the effect of a special device on the exhaust gases from a diesel vehicle. The amount of carbohydrates has been determined with a portable detector and the soot content by gravimetric means. A significant decline in carbohydrates or of the soot emission when the device was connected however, was not established. Author

N74-13667# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf.
STUDIES ON HEAT TRANSFER. 6: PROGRESS REPORT, 1972
H. Schmidl Apr. 1973 83 p refs In GERMAN; ENGLISH summary
(SGAE-2117) Avail: AEC Depository Libraries HC $6.25

Using the Navier-Stokes and energy equations, the distribution of velocity and temperature in a tube with turbulent flow can be found. In addition, with the Newton's law concerning the heat transfer, a generaly law is derived. Of some importance in these equations is the eddy diffusivity for heat and momentum transfer. In particular, the first coefficient is expressed in the literature in very different numbers. Using the general law above and the well known empirical Nu or St numbers, the eddy diffusivity for heat transfer can be found as a function of Re and Pr numbers. Author (NSA)

N74-13668# Paris Univ. (France).
MEASUREMENT OF THE THERMAL DIFFUSIVITY OF (U,Pu)O2 OXIDES. STUDIES AS A FUNCTION OF STOICHIOMETRY AND Pu CONTENTS Ph.D. Thesis
Jean-Claude Weilbacher 1972 111 p refs In FRENCH
(FRNC-TH-326) Avail: AEC Depository Libraries

The principles of the flash method are reviewed. The device developed to measure the thermal diffusivity is described. This device enables thermal diffusivity measurements to be made in a controlled atmosphere over a wide temperature range (700 to 2750 C). It consists of a heated enclosure (induction oven) provided with a sample holder, an instantaneous energy soure (Nd doped glass laser), and a device permitting accurate measurements to be made of the temperature increase of the back face of the sample. Studies of the effect of temperature on the thermal diffusivity of mixed oxides enabled the lattice and electronic contributions of the thermal conductivity to be established. The effects of deviations from stoichiometry were established. Studies of the effect of the paramagnetic ions in solution on the thermal diffusivity were made for different Pu concentrations. The limiting effect of vacancies on the high-temperature conductivity was established. NSA

N74-13669# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
USE OF DISTRIBUTION FUNCTIONS FOR THE PREDICTION OF THERMODYNAMICAL QUANTITIES [UTILISATION DES FONCTIONS DE DISTRIBUTION POUR LA PREDICTION DE GRANDEURS THERMODYNAMIQUES]
J. Y. Lenoir 1973 71 p refs In FRENCH
(Rept-009) Avail: NTIS HC $5.75

A bibliography based on the statistical computation of molecular distribution describes the state of dense gases or liquids, making use of fluid distribution functions. Statistical thermodynamics fundamentals, and definitions, in networks for computation of distribution functions are reviewed, with emphasis on the Percus-Yevick equation. The validity of perturbation theories applied to complex molecules is shown. ESRO

N74-13670# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
EXPERIMENTAL CONDITIONS DETERMINATION FOR CONSTANT VOLUME COMBUSTION CALORIMETRY IN OXYGEN [CALORIMETRIE DE COMBUSTION A VOLUME CONSTANT DANS L'OXYGENE: DEFINITION DES CONDITIONS EXPERIMENTALES]
M. Ducros 1973 19 p In FRENCH Presented at the Soc. Chim. de France meeting, Lyon, 25 Jan. 1973
(Rept-018) Avail: NTIS HC $3.00

The initial and final state of constant volume combustion calorimeters in an oxygen atmosphere are discussed. Sampling techniques such as powdering and sealing in polyethylene bags are dealt with. The merits of a rotating bomb calorimeter are reviewed. The combustion of fluorine containing compounds is discussed. The experimental conditions for beryllium hydride calorimetry were established. A general scheme for the transformations taking place in a bomb calorimeter was drawn up. Recommendations for inclusion of thermochemical considerations in the evaluation of a calorimetric experiment are given. ESRO

N74-13671# Explosives Research and Development Establishment, Waltham Abbey (England).
COMPATIBILITY TESTING OF PRIMARY EXPLOSIVES AND PYROTECHNICS
N. J. Blay and I. Dunstan Feb. 1973 30 p refs Presented at the 2nd Symp. on Chem. Problems Connected with the Stability of Explosives, Tyringe, Swed., 25-27 May 1970
(ERDE-TR-115; BR34932) Avail: NTIS HC $3.50

Factors involved in the compatibility testing of primary explosives and pyrotechnics are discussed. These are: (1) thermal stability; (2) chemial reactivity; (3) effects of charge size; (4) properties of compatible materials; (5) type of application of candidate material; and (6) presence of water. Test procedures for examining compatibility of materials and explosives used either in contact or near each other are described and some results discussed, particularly with reference to the behavior of lead azide. ESRO

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-13672*# Southeastern State Coll., Durant, Okla. Technology Use Studies Center.
[TECHNOLOGY UTILIZATION DATA SEARCHES] Quarterly Status Report, 9 Jun. - 30 Sep. 1973
C. Henry Gold, A. M. Moore, Bill Dodd, and Velma Dittmar Oct. 1973 46 p
(Contract NASw-2512)
(NASA-CR-136202; QSR-33) Avail: NTIS HC $4.50 CSCL 05B

Technology Use Studies Center activities, functions, and services are reported for this period. Transfers and searches are described. Characteristics of TUSC searches are tabulated. F.O.S.

N74-13673# National Research Council of Canada, Ottawa (Ontario).
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT, 1 JULY - 30 SEPTEMBER 1973
30 Sep. 1973 82 p refs
(DME/NAE-1973(3)) Avail: NTIS HC $6.25

A review of current activities of Canadian mechanical engineering and national aeronautical establishments is presented. The topics discussed are: (1) effects of Reynolds number at low speeds on the maximum lift of two dimensional aerofoil sections equipped with mechanical high lift devices; (2) energy in transportation; and (3) a wave buoy accelerometer unit. A list of current projects and publications is included. For individual titles, see N74-13674 through N74-13676.

N74-13674 National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
REYNOLDS NUMBER EFFECTS AT LOW SPEEDS ON THE MAXIMUM LIFT OF TWO-DIMENSIONAL AEROFOIL SECTIONS EQUIPPED WITH MECHANICAL HIGH LIFT DEVICES c01
J. A. Thain *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Sep. 1973 p 1-24 refs (For availability see N74-13673 04-34)

Published experimental data are reviewed from various sources on the variation of maximum lift coefficient with Reynolds number (RN) of two-dimensional aerofoil sections equipped with mechanical high lift devices. The importance of Mach number is also discussed. The study indicates that the stalling characteristics of single aerofoils is fairly well understood and the effect of the RN is predictable for most commonly used sections. The optimum position for a single slotted flap relative to the main wing was found to vary with RN. Predicting the maximum lift coefficient of a particular multielement section at a RN other than that tested was found to be a difficult problem. K.M.M.

N74-13675 National Research Council of Canada, Ottawa (Ontario). Engine Lab.
ENERGY IN TRANSPORTATION
E. P. Cockshutt *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Sep. 1973 p 25-32 refs (For availability see N74-13673 04-34)

The energy requirements of a variety of transportation systems are reviewed in the context of the current concern over diminishing reserves of hydrocarbon fuels. The energy costs of current passenger and cargo transportation systems are presented. The energy cost components - thermo-propulsive efficiency, frictional resistance, and structural efficiency-are assembled as a ratio for low energy cost. Charts and graphs are included. K.M.M.

N74-13676 National Research Council of Canada, Ottawa (Ontario). Instruments Lab.
A WAVE BUOY ACCELEROMETER UNIT c14
E. H. Bowler *In its* Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab. 30 Sep. 1973 p 33-53 refs (For availability see N74-13673 04-34)

An accelerometer unit is described which was developed specifically for use in either tethered or free floating buoys, for the measurement of wave displacement spectra. This instrument was used successfully in a free floating buoy for several years to gather wave data during far offshore deep water ship trials. Comparative wave displacement-frequency spectra, obtained simultaneously with the instrument and a step type wave staff, are included. Author

N74-13677# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
[CONTINUED RESEARCH IN AUTOMATIC CONTROLS, BIOENGINEERING, COMMUNICATION, AND ELECTRONIC ENGINEERING] Annual Research Summary, 1972
1972 119 p refs
Avail: NTIS HC $8.00

Summaries are presented of research in the following areas: (1) automatic controls, (2) bioengineering, (3) circuits and systems, (4) communication sciences, (5) computers and automata, (6) electromagnetic fields, (7) energy sources and systems, and (8) solid states devices and materials. D.L.G.

N74-13678# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 368
20 Nov. 1973 63 p Transl. into ENGLISH from East European articles
(JPRS-60596) Avail: NTIS HC $5.25

The serial report contains articles concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields; and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences. For individual titles, see N74-13679 through N74-13680.

N74-13679 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT TRENDS OF DIGITAL DATA STORAGE c08
N. Fichtner *In its* Transl. on Eastern Europe: Sci. Affairs, No. 368 (JPRS-60596) 20 Nov. 1973 p 25-32 Transl. into ENGLISH from Die Technik (East Ger.), Aug. 1973 p 522-525 (For availability see N74-13678 04-34)

Factors affecting the future development of digital storage techniques are investigated. The two most important considerations described are flow cost production of individual storage elements and the complete storage devices, and improvement of operating speeds of logic circuit elements and the system operating speed of the memory. A tabular listing is provided which compares several characteristic parameters of various storage devices. A.L.

N74-13680 Joint Publications Research Service, Arlington, Va.
TECHNOLOGICAL INNOVATION AND MEASURES PROPOSED TO INTENSIFY IT
Drago Paranos *In its* Transl. on Eastern Europe: Sci. Affairs, No. 368 (JPRS-60596) 20 Nov. 1973 p 35-59 Transl. into ENGLISH from Jugoslov. Pronalarstvo (Yugoslavia), Sep. 1973 p 1-12 (For availability see N74-13678 04-34)

The term technical innovation signifies creation and application of a technical solution arrived at through the inventive work of individuals or through the associated and organized work of a team. In the Law on Patents and Technical Improvements for Yugoslavia distinctions are made between inventions, technical improvements (innovation), and useful proposals (rationalizations). This paper discusses: (1) status of innovations in Yugoslavia and the world; (2) problems and future development of innovative activity; (3) legislation as factor in stimulating innovation; (4) business reports concerning Yugoslav and foreign inventions and technical achievements; (5) system for application and renumeration of inventive work in work organizations; (6) proposal for measures to intensify innovative activity in the economy; (7) public campaigns; (8) measures to be taken within work organizations and their associations; and (9) legislative measures. A.L.

N74-13681# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 370
3 Dec. 1973 28 p Transl. into ENGLISH from various Eastern European publications
(JPRS-60679) Avail: NTIS HC $3.50

Exerpts from a catalog are presented concerning the RYAD central processing units (CPU). CPU's for the ES-2010, ES-2020, and ES-2021 computers are described, and their functions are discussed. An article studying some of the factors in the transmission mechanism of serum hepatitis is also presented. The benzidine test was found to be an effective from of control over the quality of the washing and preparation of the medical instruments for sterilization. Another article presents the second implementing regulation to the epizootic disease decree in East Germany. Ninteen specifications to the decree are given along with lists of epizootic diseases, parasitoses, and contagious piscine diseases. K.M.M.

N74-13682# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.
SRDS TECHNICAL PROGRAM DOCUMENT, FISCAL YEAR

1974. ENGINEERING AND DEVELOPMENT PROGRAMS
Jul. 1973 179 p
Avail: NTIS HC $11.00

The technical program document for the fiscal year 1974 engineering and development programs of the Department of Transportation of the Federal Aviation Administration is presented. The program resumes identify the technical objective, approach, milestones scheduled for accomplishment, and requirements. The overall program is discussed under twenty-two categories which include: (1) aircraft safety, (2) air traffic control, (3) airports, and (4) weather services. Author

N74-13683# Stanford Univ., Calif. Center for Materials Research.
MATERIALS RESEARCH AT STANFORD UNIVERSITY Annual Report, 1 Jul. 1972 - 30 Jun. 1973
Nov. 1973 347 p refs
(CMR-73-16; AR-12) Avail: NTIS HC $19.50

Description of various materials research programs conducted during the period of July 1972 through June 1973 are presented. The reports were presented at a materials research symposium. Each report presents the technical objectives of the research, the method for conducting the experiments, and publications related to the effort. In appropriate cases, the specific applications of the research project are described. Author

N74-13684# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, SPACE, SCIENCE, VETERANS, AND CERTAIN OTHER INDEPENDENT AGENCIES APPROPRIATION ACT, 1974
Washington GPO 26 Oct. 1973 13 p H.R. 8825 enacted into law by the 93d Congr., 26 Oct. 1973
(Pub-Law-93-137) Avail: US Capitol, House Document Room

Congressional legislation concerning appropriations for the Department of Housing and Urban Development is presented. Additional actions to appropriate funds for space, science, veterans, and certain other independent executive agencies, boards, and commissions are included. The specific purposes of the allocated funds are identified and limitations on the expenditure of funds are imposed. Author

N74-13685# Committee on Science and Astronautics (U. S. House).
FIRE PREVENTION AND CONTROL
Washington GPO 1973 443 p refs Hearings before Comm. on Sci. and Astronaut., 93d Congr., 1st Sess., No. 15, 25-26, 31 Jul. and 1-2 Aug. 1973
Avail: Subcomm. on Sci., Res., and Develop.

Congressional hearings concerning legislation for improving fire prevention and control facilities are presented. The legislation provides for the following provisions: (1) creation of a National Fire Academy to conduct research, development, and training in fire prevention and control, (2) authority to make grants to accredited institutions of higher education to pay costs of fire science programs, (3) financial assistance to local fire departments to purchase improved firefighting equipment, and (4) extension of governmental activity in fire prevention research and development. Author

N74-13686# Committee on Science and Astronautics (U. S. House).
SPACE TUG-1973
Washington GPO 1973 272 p Hearings before Comm. on Sci. and Astronaut., 93D Congr., 1st Sess., No. 16, 5, 7, 8, 10, and 26 Sep. 1973
Avail: Subcomm. on Manned Space Flight

The Subcommittee on Manned Space Flight conducted a series of hearings on the proposed Space Tug for several reasons: (1) the determination and finding of the role of the Space Tug in the Space Shuttle program; (2) the fiscal impact of the Space Tug on the overall Manned Space Flight budget and specifically the Space Shuttle program; (3) the operations impact of the Space Tug on the latest proposed NASA mission model; (4) the operations impact on the projected cost-per-flight of the Space Shuttle (5) the ascertainment of the DOD role in the development and usage of the Space Tug; (6) NASA's and industry's progress in conceptual design of the Space Tug vehicle. In concert with the above goals, the subcommittee held hearings with NASA, General Dynamics Convair Division, McDonnell Douglas Astronautics Company, Lockheed Missiles & Space Co., Martin Marietta Denver Division, and Grumman Aerospace Corp. As contained in the body of the hearing, NASA presented an overview of the role of the Space Tug program with no conclusion nor recommended approaches at this time. Author

N74-13687# National Bureau of Standards, Washington, D.C. Office of International Relations.
COLLABORATIVE RESEARCH PROGRAM BETWEEN NBS AND INDIAN SCIENTIFIC INSTITUTIONS: SPECIAL FOREIGN CURRENCY PROGRAM, 1973 STATUS Final Report
H. Steffen Peiser, Michael B. McNeil, and Doris M. Bluebond
Nov. 1973 140 p refs
(NBS-TN-798) Avail: SOD HC $1.50 as C13.46:798

To demonstrate the wide use of such grants over the entire program structure of NBS, the grant descriptions are ordered by the elements of that program structure. Comment on the significance and purpose of the NBS/SFCP grant program is presented. Author

N74-13688# Translation Consultants, Ltd., Arlington, Va.
SURVEY OF ABSTRACTING AND OTHER SECONDARY SERVICES ON ENVIRONMENTAL SCIENCE
M. Kaemfer 1973 165 p refs Transl. into ENGLISH of "Analyse der Referateorgane und anderer Sekundaerquellen ueber Umweltschutz", Bundesanstalt fuer Vegetationskunde, Naturschutz und Landschaftspflege, Bonn, Report, July 1972 141 p Sponsored by EPA
(TR-426-73) Avail: NTIS HC $10.25

An analysis of abstracting and other secondary services on environmental science is presented. The rationale behind conducting the survey is developed. The resulting analysis lists the secondary sources, supplemented by detailed subject and country indexes. The types of secondary sources are identified and the procedure for processing environmental science is described. Author

N74-13689*# George Washington Univ., Washington, D.C.
US TECHNOLOGY: TRENDS AND POLICY ISSUES
Michael Boretsky (Dept. of Commerce) Oct. 1973 175 p refs
(Grants NGL-09-010-030; NSF GS-34902)
(NASA-CR-136302; GWPS-Mon-17) Avail: NTIS HC $10.75 CSCL 05A

A broad, factual and systematic analysis of the current state of affairs in U.S. technology is presented with emphasis on the problems it faces, and the Government's posture toward technology. Topics discussed include: current state of U.S. technology, lagging productivity growth, deterioration in the U.S. trade position, the causes of the loss of U.S. technological advantage, and policy issues. F.O.S.

N74-13690# Research Inst. of National Defence, Stockholm (Sweden).
VISIT REPORT ON THE FLYING AND SPACE EQUIPMENT EXHIBITION IN PARIS 1971 [RESERAPPORT FRAN DEN 29. FLYG OCH RYMDUTSTALLNINGEN I PARIS 1971]
Curt Haglund Oct. 1971 52 p In SWEDISH
(FOA-2-C-2494-M6) Avail: NTIS HC $4.75

Some impressions from the 29th Flying and Space Exhibition in Paris May/June 1971 are reported. The exhibition was visited during the first four days. Author

N74-13691# Research Inst. of National Defence, Stockholm (Sweden).
COMMENTS ON FOAP STATEMENTS AND WORKING. BASIS FOR A CASE PRESENTED TO FU69 MEETING, 27 SEPTEMBER 1971 [SYNPUNKTER PA FOA P UPPGIFTER OCH ARBETSFORMER. UNDERLAG FOER FOEREDRAGNING VID FU 69 SAMMANTRAEDE 27.9.71]
C. G. Jennergren Nov. 1971 28 p refs In SWEDISH
(FOA-P-C-8303-M6) Avail: NTIS HC $3.50

FOA has tried to solve the problem of directing scientific research and the transmission of results by setting up a broad contact area between the investigator and those at working level.

The development of methods for long term planning tends towards greater attention being attached to policy forming processes. In this case a consultant group which works at different levels can be meaningful because the better conditions created mean that the information between levels is comprehended in the proper way. Author

N74-13692# Research Inst. of National Defence, Stockholm (Sweden).
SOME COMMENTS ON FOA INVESTIGATION ACTIVITY [SYNPUNKTER PA FOA UTREDNINGSVERKSAMHET]
P.-O. Nilsson Oct. 1971 19 p In SWEDISH
(FOA-P-C-8296-M6) Avail: NTIS HC $3.00

The role of investigation activities as intermediaries of both the results of scientific research to the consumer and the research for research organizations is considered. Factors of significance for directing future research activities are discussed as a basis for comments on the direction of future research activity. In order to respond to the need of high ambition levels as regards research for defense, the FOA target level for research activities must be high, including an increased share of the technical system analyses and must be compentent to analyze planning and decision problems. Author

N74-13693# Institute of Nuclear Sciences, Lower Hutt (New Zealand).
[RESEARCH PROGRESS IN NUCLEAR AND THEORETICAL PHYSICS AND ISOTOPE APPLICATIONS] Progress Report, Jul. - Dec. 1972
T. A. Rafter Feb. 1973 109 p refs
(INS-593) Avail: AEC Depository Libraries HC $7.50

Work in progress during the half-year July-December 1972, is reported. The following subject areas are included: nuclear physics, radiation research, isotope geochemistry - stable isotopes, radioactive dating and fallout, radioisotope applications and atmospheric trace gases, instrumentation, and theoretical physics. NSA

N74-13694# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
ACTIVITY REPORT, 1971 [RELAZIONE SULL'ATTIVITA SVOLTA NELL'ANNO 1971]
14 Jan. 1972 40 p refs In ITALIAN
(LPS-72-3) Avail: NTIS HC $4.00

The topics discussed in the 1971 activity report fall under six main headings: cosmic rays, interplanetary plasmas, magnetic fields, IR, UV, and spaceborne detectors and electronics. Elements discussed are: continuous monitoring of the nucleonic component of primary cosmic rays, data analysis on cosmic ray modulation, solar wind experiment ESRO S-73 and S-202, low energy experiment on Sirio satellite, flux gate magnetometer for the ESRO GEOS satellite, search coil magnetometer for the Helios probe, data analysis on Pioneer 7 and 8 magnetic fields, infrared background polarized component measurement by balloonborne experiment, earth based infrared measurements of the atmospheric transparency, and ultraviolet and XUV atmospheric emission to be measured onboard OSO-J. A financial statement and a list of publications are included. ESRO

N74-13695# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
[RESEARCH IN SPACE SCIENCE FROM ORBITING SATELLITES FOR 1972] [RELAZIONE SULL'ATTIVITA' SVOLTA NELL'ANNO 1972]
Jan. 1973 43 p refs In ITALIAN
(LPS-73-4) Avail: NTIS HC $4.25

Research on the nucleonic component of cosmic rays is described. Interplanetary plasma measurements are dealt with, and instrumentation onboard HEOS 1 and HEOS 2 detailed. An experiment for the M/D satellite is presented. Magnetometer work on various satellites is described, together with Pioneer 8 data analysis. The IR radiation telescope project and IR airborne measurements are described. The UV atmospheric emission research, electronic research, and data analysis with the HP2116B computer are covered. Author (ESRO)

N74-13696# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DIFFERENTIAL GAME BARRIERS AND THEIR APPLICATION IN AIR-TO-AIR COMBAT Ph.D. Thesis
Urban H. D. Lynch Mar. 1973 252 p refs
(AD-766890; DS/MC/73-1) Avail: NTIS CSCL 15/7

The mathematical theory of perfect information, zero-sum, differential games is used as an analytical tool to learn as much as possible about the one-on-one, air-to-air combat problem and the problem parameters which have major effect on its outcome. The primary emphasis is on differential game Barrier theory and the application of the Barrier as an analytical tool for air-to-air combat analysis. A series of progressively more complex air-to-air combat models is developed and solved in such a way that the solution results of a given model have direct input to the more complex model that follows and learning from one model to the next is accumulative. The importance of the Barrier, its shape and its sensitivity to aircraft design parameters is discussed and demonstrated. (Modified author abstract) GRA

N74-13697# Stanford Research Inst., Arlington, Va. Strategic Studies Center.
LEGAL CONSIDERATIONS AND CONSTRAINTS ON US NUCLEAR POLICY Final Report
Albert Ferri, Jr. Dec. 1972 48 p refs
(Contract DAHC19-71-C-0001; SRI Proj. 8974)
(AD-754641; SSC-TN-8974-68) Avail: NTIS CSCL 05/4

A review of the major pre-SALT treaties and laws affecting U.S. nuclear policy is reported. The major items of the paper are presented mainly in chronological order. The last section of the work discusses recent trends in U. S. domestic law and their significance for U. S. nuclear policy. This research is part of a larger effort which utilizes this material in force posture analysis. This compilation is considered a handy and useful summary of constraints on nuclear policy which may have wider utility for other elements of the defense establishment. This research paper does not cover the SALTIABM Treaty nor the interim agreements on the limitation of strategic offensive weapons. GRA

N74-13698# Naval Postgraduate School, Monterey, Calif.
ADAPTATION OF SYSTEM X COMPUTER-ASSISTED PROJECT MANAGEMENT EXERCISES FOR USE AT THE NAVAL POSTGRADUATE SCHOOL M.S. Thesis
Herbert Henry Joseph Nicholson Jun. 1973 115 p refs
(AD-767652) Avail: NTIS CSCL 16/4

System X is a series of project management oriented case studies supported by an interactive time-sharing computer program simulating the analysis and evaluation of a hypothetical surface-to-surface guided missile system acquisition program. The computer-assisted exercises operate from baseline data supplied by a data base, along with system parameters set by the user, in order to compute various deterministic statistics regarding system performance and system costs. The system parameter values may be readily changed and the computations repeated. A desired result may be obtained by repeated iterations of the process. Author (GRA)

N74-13699# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A TWO-REFERENCE-POINT PROCEDURE FOR LOCATING A TARGET Final Report, Oct. 1969 - Sep. 1971
Nilss M. Aume May 1973 24 p refs
(AF Proj. 7184)
(AD-767211; AMRL-TR-72-90) Avail: NTIS CSCL 15/7

Subjects flying in a light aircraft at 3000-ft altitude estimated the locations of ground targets in relation to two fixed markers. Sighting was done with naked eyes or by use of a special sighting device. The estimates were expressed in polar coordinates: the distance was expressed as a ratio to the inter-marker distance, and the angle in terms of clock hours with respect to a line through the markers. A target precisely in middle between the markers produced no error. Otherwise, errors--the distance between the target and its estimate--increased with greater target-to-center distances. The sighting device failed to produce any improvements, due to the amount of tracking necessary and to turbulence. Author (GRA)